3.

THE EFFECT OF THE *NITROUS VAPOUR,* IN PREVENTING AND DESTROYING CONTAGION;

ASCERTAINED, FROM A VARIETY OF TRIALS,
MADE CHIEFLY BY
SURGEONS OF HIS MAJESTY'S NAVY,
IN PRISONS, HOSPITALS, AND ON BOARD OF SHIPS:
WITH AN
INTRODUCTION
Respecting the Nature of the Contagion,
WHICH GIVES RISE TO THE
JAIL OR HOSPITAL FEVER;
AND
THE VARIOUS METHODS FORMERLY EMPLOYED TO PREVENT OR DESTROY THIS.

BY
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1799.

TO

THE RIGHT HONOURABLE

EARL SPENCER,

&c. &c. &c.

MY LORD,

AS moſt of the following trials with the nitrous vapour were made in conſequence of an order iſſued by your Lordſhip, and the other Lords Commiſſioners of the Admiralty, for employing it in the navy; it muſt afford you ſome ſatisfaction to obſerve, that ſucceſs has followed your Lordſhip's deciſion on this, as on more important occaſions: nor can you be ſurpriſed that I ſhould be deſirous of prefixing your name to a publication, which owes its exiſtence, in great meaſure, to yourſelf. I have now no occaſion

to ſolicit your Lordſhip's recommendation of a meaſure, which a conviction of its utility has already led you to adopt; but I have to thank you, which I do moſt ſincerely, for the attention you have given to the ſubject, and for your candour and politeneſs to the Author.

I have the honour to be,

With the moſt perfect conſideration and reſpect,

My Lord,

Your Lordſhip's moſt obedient,

And much obliged ſervant,

JAS CARMICHAEL SMYTH.

Earl Spencer.

PREFACE.

PREFACE.

THREE years have now almoſt elapſed ſince I publiſhed an account of the experiment made with the nitrous fumigation on board the Union hoſpital ſhip, and of the ſimilar trials made at the ſame time on board ſome ſhips of the Ruſſian ſquadron.

The accurate and candid narrative of this buſineſs, given by thoſe gentlemen, who undertook the conducting it, proved in the cleareſt and moſt unequivocal manner, to every unbiaſſed mind, not only the power of the nitrous vapour in deſtroying contagion, but the ſafety with which it might be employed: ſuch, however, is the force of prejudice, as to render doubtful even the evidence of our ſenſes. A conſiderable encreaſe in the number of deaths, amongſt the Ruſſians,

happening in the month of January, a rumour was immediately propagated that this mortality was occaſioned by the nitrous fumigation, which, though it might ſeem harmleſs in the beginning, poſſeſſed ſome latent deleterious quality that in the end proved fatal.

Hearing of this by accident, and knowing how difficult it is to remove impreſſions that have once laid hold of the public mind, I made application to Lord Spencer, and to the other Lords Commiſſioners of the Admiralty, requeſting that they would have the goodneſs to appoint proper perſons to inveſtigate this matter fully, and to report to their Lordſhips the reſult of their enquiry. My requeſt was complied with, and the report of thoſe gentlemen proved in the moſt ſatisfactory manner, that the rumour was a direct miſrepreſentation of the fact; that the mortality amongſt the Ruſſians was owing to different cauſes unconnected with the fumigation; that thoſe who had been longeſt ex-

poſed to it, enjoyed the beſt health; and that not a ſingle inſtance could be adduced of any bad conſequence which could fairly be imputed to the nitrous vapour, during the three months it had been employed.

This objection being removed, another ſtill preſented itſelf. It had been ſaid, and ſaid with truth, that the vitriolic acid, in a concentrated ſtate (commonly called oil of vitriol) was a dangerous article to be taken on board of ſhip, as there had been inſtances of ſhips ſet on fire by it; and that this accident actually happened to two tranſports of Admiral Chriſtian's ſquadron. The fact could not be denied; but the ſame objection applied, and with ſtill greater force, to the uſe of fire, of gun-powder, and of ardent ſpirits; all of which are, without doubt, extremely hazardous in the hands of ignorance or of raſhneſs; but which, when their effects are known, with the proper means of obviating them, may be employed with as much ſafety as air or water. To do away, however,

every

every poſſible objection on this head, I had proper caſes made, one for the mineral acids, and another for the purified nitre, with the inſtruments neceſſary for the fumigation. The mineral acids were firſt put into ſtrong glaſs bottles, fitted with ground glaſs ſtoppers, ſecured with wire; theſe were placed in a caſe lined with copper covered with an amalgama of tin and lead, with diviſions of the ſame; the interſtices of the diviſions were afterwards filled up with ſaw-duſt: by this means, the bottles were ſecured from breaking, and even if that ſhould happen, the acids could not eſcape, nor affect the lining of the caſe; ſo that every danger which could poſſibly ariſe was compleatly foreſeen and prevented. A caſe ſimilar to the former, but entirely of wood, with diviſions of the ſame, was made for holding the nitre: the nitre was put into four ſtone or earthen jars, adapted to four diviſions in the caſe, which had a fifth diviſion alſo, the whole width of the caſe, for containing the pipkins, cups, meaſures, and

other

other inſtruments neceſſary for the fumigation. Theſe caſes I ſent to the Admiralty for the inſpection of their Lordſhips, and as they met with their approbation, their Lordſhips ordered ſimilar caſes to be made, and ſent on board every ſhip in his Majeſty's ſervice; and that the materials neceſſary for the nitrous fumigation ſhould be ſent alſo to the different naval hoſpitals and priſons. I need hardly add, that the greater part of the experiments and trials which I have now the honour to lay before the public, are the reſult of this order of the Lords Commiſſioners of the Admiralty.

Many of thoſe communications have been ſent to me, as will preſently appear by the Board for ſick and wounded ſeamen; but for ſeveral, by far the moſt important, I am indebted to the friendſhip of Dr. Johnſton, one of the Commiſſioners of that Board, a gentleman whoſe humanity and active zeal in the ſervice of his country are well known, and whoſe character ſtands too

high in the public opinion, to receive any addition from my praiſe. He was fortunately one of the extra-Commiſſioners at Portſmouth, when ſome of the firſt trials were made with the nitrous fumigation, and from the happy effects produced by it, became a warm advocate in its behalf; a circumſtance which firſt introduced me to the honour of his acquaintance.

As for the gentlemen themſelves who have made the trials with the nitrous fumigation, I ſhall only obſerve, that they cannot be ſuſpected, in the reports or opinions they have delivered on this ſubject, to have been influenced by any partiality to me; as, excepting Captain Lane of the navy, I had not the honour of the ſlighteſt acquaintance with any of them; and ſeveral, though they had heard of the experiment on board the Union, had never read a word I had written on the ſubject. It appears, however, very evident from their letters, that there are amongſt them men of obſervation and experience, and

if

if we may judge from the important ſtations in which ſome of them are placed, they are men of high and reſpectable characters in the ſervice. Reſpecting their obſervations, I may fairly ſay, that in general, they carry with them the internal evidence of truth. But I ſhall examine this ſubject more particularly, after having preſented the public with the letters and communications of the authors.

Of the Introduction I have only to remark, that it contains thoſe general obſervations on the jail and other putrid contagions, with the uſual means of obviating theſe, formerly publiſhed in the Treatiſe on the Fever at Wincheſter; and now republiſhed, from a wiſh to make them more generally known, eſpecially to thoſe perſons who are likely to be placed in ſimilar ſituations, or engaged in ſimilar enterprizes. It does not fall to the lot of every ſurgeon, or even phyſician, to the navy or army, to have turned his attention to this ſubject in the manner I have done, nor

to

to have had the ſame means or opportunity of information. The chief object of my life has been to render my profeſſion, and the exerciſe of it, as beneficial as poſſible to mankind; my endeavours, however, to bring to perfection, and into general uſe, the preſent diſcovery, have been chiefly animated, and I am not aſhamed to confeſs it, by the deſire of rendering an important ſervice to my country. She, as the great maritime power in Europe, is the moſt likely to derive, and I flatter myſelf, will derive the moſt eſſential benefit from my labours.

Chari Parentes, Chari Liberi, Propinqui Familiares: ſed omnes omnium Charitates, Patria una complexa eſt.

CON-

CONTENTS.

Page

Introduction - - - - - 1
Experiment on Board the Union, &c. 49
Letter from David Paterſon, Eſq. Surgeon to Forton Hoſpital - - 115
Three Letters from Mr. M'Grigor, Surgeon to the 88th Regiment, at Jerſey 152
Three Letters from Mr. Hill, Surgeon to the Sincerity Hoſpital Ship, Langſtone Harbour - - - - 166
Letter from Mr. Griffin, Surgeon to Forton Hoſpital - - - - 178
Letter from Mr. Glegg, Surgeon to the Defiance Man of War - - 186
Letter from Mr. Magennis, Surgeon to the Hoſpital at Norman Croſs - 188
Letter from Mr. Snipe, Surgeon to the Naval Hoſpital at Yarmouth - 195
Letter from I. Blatherwick, Eſq. - 201
Letter from Captain Lane, Farham 203

Page

Letter from Alexander Brown, Esq. Surgeon of the Royal Sovereign - 206

Letter from Mr. John Drew, Surgeon of the Unité - - - 208

Extracts from Letters or Journals of Surgeons of the Navy, transmitted by the Board of Sick and Hurt - 209

Extract of a Letter from Dr. Withering, of Birmingham, to Dr. Duncan, of Edinburgh - - - 215

Two Letters from Dr. Carmichael Smyth, to Dr. Percival, of Manchester 216

Conclusion - - - 223

Tables.

INTRO-

The READER *is requeſted to examine theſe* TABLES *with Attention, as they afford, perhaps, the moſt complete Evidence, of a Medical Fact, that ever was preſented to the Public.*

Office for ſick and wounded Seamen, &c.

A Weekly progreſſive State of the Sickneſs and Mortality among the Spaniſh Priſoners, confined in the King's Houſe, at Wincheſter, from the firſt Appearance of the Jail Diſtemper, until the 8th of July, 1780.

Date of Weekly Accounts.	Number of Spaniſh Priſoners. In Cuſtody.	Sick.	Dead.
March 26, 1780	1247	60	1
April – 2, ——	1243	106	4
—— 9, ——	1475	150	10
—— 16, ——	1457	172	18
—— 23, ——	1433	142	21
—— 30, ——	1412	171	21
May – 7, ——	1388	191	25
—— 14, ——	1351	197	27
—— 21, ——	1523	205	30
—— 28, ——	1494	226	31
*June – 3, ——	1461	262	33
—— 10, ——	1437	212	26
—— 17, ——	1426	173	9
—— 24, ——	1420	167	5
July – 1, ——	1414	143	5
—— 8, ——	1433	122	2

* The time of Dr. Carmichael Smyth's going to Wincheſter.

A Weekly Return of the Patients in Forton Hoſpital, &c. from the 16th of October to the 26th of December, 1796. By D. PATERSON, Eſq. Surgeon to the Hoſpital.

Before the Nitrous Vapour was uſed.

Weeks	Higheſt Number in the Hoſpital	Number diſcharged	Number dead
1	223	2	8
2	372	4	21
3	371	0	13
4	369	1	9
		7	51

After the Nitrous Vapour was uſed.

Weeks	Higheſt Number in the Hoſpital	Number diſcharged	Number dead
1	340	27	6
2	332	7	5
3	342	11	8
4	340	8	4
5	486	12	1
6	539	63	5
		128	29

A Return of the Attendants on the Hoſpital, or Perſons belonging to the Ship's Company of the Union, who were attacked with the Contagious Fever, from the 3d of Septemper, 1795, to the 10th of February, 1796.

(Signed) A. BASSAN, Surgeon of the Ship.

Before the Nitrous Vapour was uſed.

Quality	When ſeized		Recovered	Dead
Nurſe	Sept.	6	——	
——	——	7	——	
——	——	9	——	
——	——	11	——	
Sˢ 1ſt Mate	——	15		Sept. 24
Nurſe	——	18	——	
——	——	20	——	
Helper	——	22	——	
Nurſe	——	24		Sept. 28
Marine	——	29		Oct. 1
Waſher-wo.	Oct.	6		— 15
Sˢ 1ſt Mate	——	6	——	
Nurſe	——	8		— 11
Ab.	——	8	——	
Nurſe	——	14	——	
2d Sˢ Mate	——	22	——	
Ab.	——	22	——	
Marine	——	22	——	
Nurſe	Nov.	2	——	
Waſher-wo.	——	4	——	
Marine	——	4	——	
——	——	10	——	
Ab.	——	10	——	
—	——	17	——	
—	——	17	——	
Marines	——	18	——	
Sᵗ Marines	——	18	——	
Ab.	——	20		Dec. 4
Marine	——	20		Nov. 24
Waſher-wo.	——	24		T. uncertain
	Total	30	23	8

After the Nitrous Vapour was uſed.

Quality	When ſeized		Recovered	Dead
Nurſe	Dec.	25	{ Recov. in a few days	
Marine	——	26		Jan. 6
	Total	2	1	1

N. B. On the 26th of November, the ſhip was fumigated for the firſt time, and the fumigation repeated twice a day till the 17th of December; from that time to the 26th of December, only once; but from the 26th of December to the 10th of February, twice a day, as at firſt.

A Monthly and Daily RETURN of the CONVICTS attacked with the Jail-Fever on board the Hulks, and received into the *Sincerity* Hoſpital Ship in Langſtone Harbour, from the 6th of July to the 26th of December, 1798. By S. HILL, Surgeon to the Hoſpital.

Months	Days	Numbr
July	—	— 16
Aug.	—	— 66
Sept.	—	— 120
Oct.	1	5
	2	3
	3	7
	4	11
	5	3
	6	7
	7	3
	8	4
	9	2
	10	2
	11	6
	12	8
	13	3
	14	5
	*15	9
To the 16th		77

Month	Days	Numbr
Oct.	16	3
	17	2
	18	1
	19	2
	20	3
	21	4
	22	3
	23	1
	24	3
	25	2
	26	1
	27	2
	28	1
	29	1
	30	0
	31	1
To the 31ſt		30

Month	Days	Numbr
Nov.	1	1
	2	1
	3	—
	4	1
	5	—
	6	3
	7	1
	8	1
	9	—
	10	7
	11	7
	12	3
	13	1
	14	—
	15	—
	16	—
	17	—
	18	—
	19	—
	*20	—
	21H	—
	22	—
	23	1
	24	7
	25	4
	*26	2
	27	3
	28	2
	29	2
	30H	3
		50

Month	Days	Numbr
Dec.	1	3
	2	2
	3	3
	4	5
	5	—
	6	5
	7	4
	8	3
	9	2
	10	2
	11	3
	12	2
	13	1
	14	2
	15	1
	16	3
	17	2
	18	2
	19H	6
	20	2
	21	2
	22	3
	23	2
	24	1
	25	1
	26	2
		64

* On the evening of the 15th of October, we began to fumigate the hulks, and continued to do ſo every day to the 20th of November, (the 9th and 10th of this month excepted;) on the 20th, the fumigation was diſcontinued, but reſumed on the 26th, and continued without interruption to the 13th of January, 1799, though on the 26th of December the ſickneſs had intirely ceaſed.

[H] On the 21ſt of November, eight perſons ill with the jail-fever, or dyſentry, were received into the hoſpital, from on board the Hillſborough Botany-bay ſhip, outward-bound; eleven more were received on the 30th of the ſame month, and five on the 19th of December: in all, twenty-four.

INTRODUCTION.

Reſpecting the Nature of the Contagion, which gives riſe to the Jail or Hoſpital Fever.

THAT we may be able to form a more accurate judgment of the nature of the contagion, which gives riſe to this ſpecies of fever, we ſhall examine it in four different points of view.

In the firſt place, how it is generated; 2dly, in what manner it is propagated, with the circumſtances more or leſs favourable to its communication; 3dly, its effects on the human body; and, 4thly, the means of weakening its virulence, or of entirely deſtroying it.

Whoever has conſidered contagious fevers with that attention which the importance of the ſubject demands, muſt have obſerved, that they are of two very diſtinct kinds or *claſſes.

* This diſtinction ſeems ſo extremely obvious, that we ſhould hardly ſuppoſe it could eſcape the obſervation of any one who had at all reflected on the ſubject, and yet I do not know any medical writer who has made it.

The firſt may properly enough be called *ſpecific contagions*, as they do not ariſe from any general quality, or proceſs of nature, with which we are acquainted; and, as they have a peculiar origin, they excite diſeaſes of a peculiar kind; differing in many reſpects from every other, but in nothing more remarkably, than in this, that the peculiar diſeaſe can only take place once in any individual: and there are ſome perſons, in whom this contagion never can produce any morbid ſymptom. The number of thoſe peculiar or ſpecific poiſons is not yet aſcertained; but the ſmall-pox and meaſles are evidently ſuch to man, and there are others peculiar to certain animals.

The ſecond claſs of contagious fevers, may be named *general contagions*, as they ariſe from a general cauſe; or they may be named *putrid*, as they will be found, in every inſtance, to be the reſult of putrefaction, one of thoſe general fermentative proceſſes, to which water as well as all vegetable and animal ſubſtances, under certain circumſtances, are liable. That the contagion, or miaſma, of the jail or hoſpital fever derives its origin from this ſource, admits of every ſpecies of evidence which a matter of fact and of obſervation can do.

It is well known, that this diſeaſe is conſtantly produced where a number of people are ſhut up together in a cloſe place, without the greateſt attention to cleanlineſs, and a renewal of air. That all the excretions of the human body have made a certain advance or progreſs towards putridity, and when placed in circumſtances favourable to putrefaction, ſoon become highly putrid. That of all the human excretions, none is more highly animaliſed, or more ſuſceptible of becoming putrid, than the perſpiration or vapour iſſuing from the ſurface of the body and lungs. That even the perſpiration of vegetables, confined under ſimilar circumſtances, becomes putrid, and in a high degree noxious to man: a *fortiori* then, we may conclude, that animal perſpiration will more quickly undergo a ſimilar alteration, and muſt prove ſtill more noxious.

We obſerve, that the contagion, reſulting from animal perſpiration, ſhews its baneful effects more ſuddenly, and more forcibly, in proportion to its quantity, and to its being placed in circumſtances the moſt favourable to putrefaction; conſequently, in proportion to the ſize and cloſeneſs of the place, the

temperature * and moiſture of the air, and the additional or acceſſory putrid matter with which it is combined.

We obſerve, likewiſe, that the formation of this contagion is prevented by cauſes that renew the air, and carry off the perſpiration, or prevent its tendency to putrefaction.

And, it may be mentioned as an analogical proof, that a contagious vapour, differing only in degree of virulence from the

* It has been alledged in objection to this, that the jail fever is more frequent in our priſons in winter than in ſummer. The fact I can neither confirm nor deny, but admitting it in its fulleſt extent, it by no means invalidates the opinion I have endeavoured to eſtabliſh. The cold of our winters is ſeldom ſo ſevere, at leaſt for any length of time, as to freeze the moiſture of the atmoſphere, eſpecially within-doors, and therefore, I run no riſk of contradiction, when I affirm, that in general, the moiſture or water diffuſed in the atmoſphere, is much greater during the winter, than during the ſummer months; but the cold, though not in general ſufficient to dry the air, is ſufficient for thoſe confined in the cells of priſons to endeavour to exclude it, although, by excluding it, they muſt prevent the renewal of the air, and breathe more their own baneful atmoſphere. Cold has alſo the effect of making people in their ſituation, leſs attentive to cleanlineſs, and of inducing lazineſs and debility; all of which circumſtances, when taken into the account, will be found greatly to counterbalance the difference of temperature.

human

human miaſmata, is conſtantly produced from water alone, or from water mixed with vegetable and animal matters, when expoſed in ſufficient quantity and under circumſtances favourable to putridity; but the ſeptic nature of the jail contagion will be farther illuſtrated, by what we have to notice of its effects on the human body, and of the methods of deſtroying it, or of rendering it harmleſs.

Of the Manner in which Contagion is communicated.

EVERY perſon knows that contagious fevers, whether *ſpecific* or *putrid*, are uſually propagated by an immediate communication with the ſick, either by contact or contiguity. How far the contagious atmoſphere extends, is impoſſible to aſcertain, as this muſt admit of *conſiderable* latitude*, according to the virulence of the diſeaſe, ſituation of the ſick, ſeaſon of the year, ſtate of the atmoſphere, &c. My ingenious and reſpectable friend Dr. Haygarth is of opinion, and indeed has ſhewn, that in the ſmall-pox it is much more limited than was apprehended. But it

* This ſubject the reader will find treated more fully in two Letters addreſſed to Dr. Percival, of Mancheſter.

is not only from a direct communication with the ſick that contagious fevers are propagated; unfortunately, the perſons and clothes of thoſe who remain long in a contagious atmoſphere, and the excretions of the ſick, are capable (even when conveyed to a great diſtance, or preſerved for a length of time) of producing the ſame miſchief as an immediate communication with the ſick themſelves. Of this fact the examples are ſo numerous as to put the matter beyond the poſſibility of a doubt. Here again, the opinion of my friend Dr. Haygarth differs from the opinions formerly entertained by phyſicians. For, though he admits, that the variolous matter, and the more ſenſible excretions of the ſick, are capable of communicating the diſeaſe, and, if cloſe ſhut up, of retaining that power for a long time, he does not think, that the contagious vapour, immediately ariſing from the ſick, can be retained by the clothes of thoſe confined in the variolous atmoſphere, or by the furniture in the chambers of the ſick, ſo as to communicate the diſeaſe to ſuch as have not themſelves been immediately expoſed to it. No one can have a greater reſpect for the opinions and obſervations of Dr. Haygarth than I

have,

have, as no perſon is better acquainted with his candour and accuracy. I readily agree with him, that the dread of thoſe terrible diſeaſes, and the natural fears of men, have poſſibly magnified the danger beyond reality; that the riſk of propagating the contagion in this manner is by no means ſo great as had been ſuppoſed; and that phyſicians, or even apothecaries, are ſeldom ſo long expoſed to this atmoſphere, as to be in great danger of conveying the contagion elſewhere; but I cannot go ſo far as to believe that the perſons, and eſpecially the clothes of nurſes or aſſiſtants, who are conſtantly confined in the chambers of the ſick, ſometimes not very well ventilated, will not imbibe the contagious vapour to ſuch a degree, as to be capable of communicating it, eſpecially where they have a direct or immediate intercourſe with a perſon ſuſceptible of the diſeaſe. But, putting the ſmall-pox and other *ſpecific contagions* out of the queſtion, that the jail diſtemper and other *putrid contagions* are frequently conveyed in this manner, cannot be denied. Indeed, wherever a vapour can be diſtinguiſhed by the ſmell, we have the demonſtration of our ſenſes for what a length

of time, not only clothes, but furniture, and even the boards and walls of houſes will retain it: therefore, in reſpect to the contagion of the jail or hoſpital fever, we may ſafely affirm, that it affects not only thoſe who are immediately expoſed to the original atmoſphere, but that this contagion may certainly be communicated by the clothes of perſons who have for any length of time been confined in it; and, what is ſtill more ſurpriſing, even when the perſons themſelves have ſuffered no injury, nor had any diſeaſe in conſequence of ſuch expoſure.

This fact being aſcertained, we cannot wonder if thoſe who are ſeized with the jail fever, owing to ſuch communication, ſhould during their illneſs generate a contagious vapour; but, however paradoxical it may appear, I have never obſerved that the ſick propagated the diſeaſe ſo readily, as the bodies and clothes of thoſe who, though well, had been long confined in the original atmoſphere. From my own experience alſo, I am led to conclude, that there is little riſk of receiving the contagion from dead bodies, even from diſſecting them, provided the ſurgeon does not cut himſelf during the diſſec-

tion.

tion, the conſequence of which has generally proved fatal.

There are ſeveral other circumſtances, worthy of notice, that increaſe or diminiſh the facility with which contagion is communicated. Unleſs where contagion is very powerful, it is ſeldom propagated in the open air; I knew only one inſtance of this at Wincheſter. It is much more certainly communicated in a room, and eſpecially if there is a current of air, from the contagious perſon to others capable of being affected. A moiſt atmoſphere* is alſo more favourable to the communication of contagion than a dry one. A contagious perſon becomes greatly more ſo, if his clothes are wet, and his body heated by exerciſe, ſo as to be in a ſtate of perſpiration. Thoſe moſt ſuſceptible of contagion are, young perſons, particularly if they come di-

* Moiſture appears not only neceſſary to the production of putrid contagion, but it would ſeem to be the medium alſo by which it is communicated; it is well known, that the plague ceaſes, in Syria and Egypt, during the prevalence of certain drying winds; and its almoſt entirely diſappearing during the winter, at Moſcow, was probably owing to the ſame cauſe; viz. the dryneſs of the atmoſphere.

rectly

rectly from a pure air into the infected atmosphere; perſons whoſe minds are oppreſſed with fear or anxiety; or who have been weakened by previous illneſs; even thoſe who have been fatigued, or are faſting, more readily than others whoſe ſtrength has not been impaired, or which has been again recruited with food. It has been farther remarked, that perſons who have iſſues are ſeldom affected by contagion.

Of the Effects of putrid Contagion on the human Body.

Putrid matter, in whatever way generated, if in ſufficient quantity, has always ſome deleterious effect; or, in other words, acts as a poiſon upon the body. It is true, that the human ſtomach, and ſtill more remarkably, the organs of digeſtion of certain animals, have the power of counteracting the ſeptic tendency; but this power, in our ſtomachs at leaſt, is very limited; and when any matter, whether generated in the body or introduced from without, has acquired a degree of putridity beyond this, it occaſions nauſea, vomiting, purging, great oppreſſion

at

at the region of the ſtomach, and often a fever, either of the intermittent, remittent, or more continued kind. Putrid matter, directly introduced into the ſyſtem by means of a wound, cauſes ſwelling and inflammation of the lymphatic glands, often terminating ſuddenly in gangrene, along with the ſymptoms of a fever, greatly reſembling the hoſpital or jail fever: the ſame proſtration of ſtrength, tremors, anxiety, headach, and delirium; with the ſame irregularity in the pulſe, and, if the diſeaſe continues, it induces thoſe appearances of the ſkin, hemorrhages, and other ſymptoms, that indicate a relaxation of the ſolids, and reſolved craſis of the blood. The fevers that ariſe in conſequence of expoſure to putrid vapour or contagion, aſſume a variety of types and forms, according to the various circumſtances of combination, degree of putridity, ſeaſon of the year, conſtitution of the patient, &c. But they, as well as the preceding, will be found to have many ſymptoms in common, and ſimilar to the jail and hoſpital fever: and in reality all the fevers of this claſs, from the ſlighteſt vernal intermittent to the true plague, are in my opinion only different ſhades or varieties of the ſame diſeaſe,

diſeaſe, and productions of one common cauſe, viz. putrefaction. I ſhall not, however, proſecute this ſubject farther at preſent, as I have treated it more fully in another work, which, ſhould I hereafter have leiſure to complete, I hope to render not altogether unworthy of the public eye.

The contagion then of the jail or hoſpital fever, may juſtly be conſidered as one of the moſt ſubtil and powerful vapours of the putrid kind; and, conſequently, its immediate and deſtructive effects upon the body are not to be wondered at. In ordinary caſes of fever, the vital principle is rouſed into action, and Nature is commonly ſufficient of herſelf to remove the morbid cauſe; but here, as in the real peſtilence, the contagion introduced into the body, ſeems to act as a narcotic poiſon upon the heart and nervous ſyſtem, ſuppreſſing the principle of life, inſtead of rouſing it to the conflict. In this diſtemper therefore, where nature can do ſo little, and even art, unleſs immediately called to her aſſiſtance, is equally unavailing, it is of the utmoſt conſequence for us to know whether the contagion cannot be prevented or deſtroyed.

Of the Means of preventing, and of deſtroying, the Jail Contagion.

As we are perfectly acquainted with the cauſes of the jail contagion, we could certainly prevent its formation, provided the means of doing ſo were always in our power; but as we cannot command theſe, our next object is to endeavour to correct, or deſtroy it, when formed. As a knowledge of the nature and origin of the jail contagion naturally led to the proper and effectual means of correcting or deſtroying it, ſo, on the other hand, the means that have been ſucceſsfully employed to deſtroy it, afford the moſt convincing evidence of its true nature.

The various means hitherto employed for deſtroying contagion, may be arranged under two diſtinct heads, or claſſes, viz. the Phyſical and the Chemical.

All contagions, whether ſpecific or putrid, are either checked or completely deſtroyed, by the extremes of heat and cold; and from a free expoſure to air and water, are ſo diluted or diſſolved, as to loſe their noxious quality.

Heat

Heat and cold then, with air and water, may be looked upon as phyſical agents, which, under certain circumſtances, are effectual in blunting or deſtroying contagion. A degree of heat, nearly that of an oven, is found neceſſary for the complete deſtruction of contagion, but as this degree of heat is incompatible with animal life *, its application is ſolely confined to the purifying of ſuch clothes, furniture, &c. as cannot be injured by this treatment. But, although the degree of heat requiſite for the complete deſtruction of contagion can only be uſed for one particular purpoſe, heat and fire, judiciouſly managed, may, in various ways, tend to leſſen the power, or to check the progreſs, of this pernicious vapour: for as cloſeneſs and dampneſs are favourable to the production and ſpreading of contagion, drying and rarifying the air, by counteracting theſe, muſt, ſo far at leaſt, be proper antidotes. But, independent of thoſe effects of heat, an open fire,

* A great heat, like that of an oven, ſuch as would prove deſtructive to all animal life, effectually deſtroys this infection in all ſubſtances which can be for ſome time expoſed to it. Vide Lind's Obſervations on the Jail Diſtemper, Ann. 1779.

eſpecially where the fuel is burnt in a narrow flue, is of great benefit; for, by conſuming a portion of the air, it cauſes a more ſenſible renewal of it, and, in fact, is one of the beſt ventilators. In employing fire and heat, however, care muſt be taken not to increaſe the heat in the apartments of the ſick, as this would prove more hurtful to them, than the drying or renewing of the air could be advantageous.

The degree of cold neceſſary to deſtroy contagion is probably, like the degree of heat, inconſiſtent with life; and, therefore, although we hear of contagion having been checked or ſuppreſſed by cold, there are few inſtances, if any, of its being completely deſtroyed. Beſides, as it is not in our power to employ cold at pleaſure, the queſtion reſpecting its effect, of whatever importance it may be to the pathologiſt, is of little conſequence to the practical phyſician.

That noxious vapours are hurtful only when concentrated, and are harmleſs when diffuſed, are facts or data univerſally admitted; and it is upon this principle, that clothes, bedding, or other matters to which contagion adheres, are purified, or loſe their

deleterious quality, by expoſure for a ſufficient length of time to the open air, or to a current of water; but, as the time requiſite for this mode of purification is uncertain, and as contagious clothes, goods, &c. cannot always be expoſed in a proper manner *, we are commonly under the neceſſity of having recourſe to thoſe more expeditious means of purification which chemiſtry affords, and which I ſhall next examine.

The chemical means hitherto employed for deſtroying contagion, are the following:

Burning ſulphur with charcoal.
——— with arſenic.
nitre.
gunpowder.
portfire.
tar.
tobacco.
wood.

* Dr. Lind has very juſtly remarked, that no ventilation or admiſſion of air into priſons or hoſpitals, can remove or deſtroy contagion when once it is preſent. The ſame may be ſaid of water. But though neither one nor the other under thoſe circumſtances can deſtroy contagion, both may be uſefully employed in blunting its force, and in preventing the ſpreading of the diſeaſe.

Boiling

Boiling vinegar.

——— with camphire.

tar.

Waſhing with vinegar.

White-waſhing.

Painting.

The vapour produced by the burning of ſulphur, is known to be the volatile vitriolic or ſulphureous acid, one of the moſt powerful of the mineral kingdom, the effect of which in deſtroying contagion has been long eſtabliſhed; but as it affects, even in ſmall quantity, the reſpiration of animals, inducing ſuffocation and death, it can only be employed for fumigating clothes, furniture, or empty apartments. When burnt with charcoal, in the common way, we obtain not only the ſulphureous acid, but alſo the carbonic, or fixed air, which, though it can have little influence on contagion, renders the common air leſs fit for reſpiration; a circumſtance hardly deſerving attention where the ſulphur is burnt in a fumigating room, or a place ſet apart expreſsly for the purpoſe of fumigation, but which is of great importance when ſulphur is burnt between the

decks of ſhips, or in hoſpital or priſon wards, where men are ſoon afterwards to be lodged. The occaſional addition of arſenic ſeems to have been made by Dr. Lind, with a view of increaſing the deleterious * quality of the vapour; but it appears unneceſſary, as the ſulphureous acid is of itſelf ſufficiently powerful for deſtroying contagion; beſides, I doubt much, if the vapour of arſenic is not too heavy to riſe with the acid of ſulphur.

Burning or deflagrating nitre.—Having had ſome experience of the efficacy of the nitrous acid in deſtroying contagion, and being ſenſible of the diſadvantage of fumigating hoſpital or priſon wards by burning ſulphur with charcoal, as was commonly practiſed, I reſolved to employ nitre, inſtead of ſulphur, at Wincheſter; never doubting that I ſhould obtain, by deflagrating nitre, a portion of nitrous acid, as well as the dephlogiſticated nitrous air or oxygene; but a farther acquaintance with chemiſtry convinced me of my miſtake, and that the deflagration of nitre never produced

* It was an old and very generally received opinion, that contagious diſeaſes, as well as ſome infections, were cauſed by inſects, and therefore Dr. Lind might think, that the moſt deleterious vapour would prove the moſt effectual in deſtroying contagion.

any

any nitrous acid. It is therefore evident, that deflagrating nitre in the prison and hospital wards at Winchester, could have no effect in destroying contagion, and no farther effect in purifying them, but so far as it furnished a quantity of oxygene, or air much purer than the common air of the atmosphere.

I observe, in Dr. Rush's publication on the yellow fever of Philadelphia, that the physicians of that city lately fell into the same mistake that I formerly did, *viz.* deflagrating or burning nitre as a means of destroying contagion.

Burning gunpowder.—If there is no nitrous acid obtained by burning or deflagrating pure nitre, we cannot expect to procure any from burning gunpowder *, either wet or dry †. The charcoal in the composition possibly yields a small quantity of carbonic acid, whilst the sulphur, uniting chiefly with the alkaline

* Gunpowder consists of seventy-five parts of pure nitre, fifteen and a half of charcoal, and nine and a half of sulphur.

† Next to the smoke of wood, for purifying a tainted air, I esteem that of gunpowder. This I often use, as being quite inoffensive to the lungs, &c. Vid. Lind on Fevers and Infections, p. 51.

baſis of the nitre, forms a hepar ſulphuris, as the water uſed in waſhing a gun plainly ſhews.

Burning portfire *.—This compoſition of ſulphur, nitre, and charcoal, has likewiſe been employed † for deſtroying contagion; and as the ſulphur in this is the predominant article, it will perhaps furniſh ſome ſulphureous acid, though I ſhould apprehend not a ſufficient quantity to be effectual in deſtroying contagion.

Burning tar ‡.—The uſe of tar ſeems natural enough to ſailors, who may be ſuppoſed partial to what they are conſtantly accuſtomed; but, if we examine the ſubject with attention, it is evident that the vapour ariſing from tar, whether burnt or boiled, muſt be a weak agent againſt contagion. The empyreumatic oil can be of no ſervice but by oppoſing one diſagreeable ſmell to another, whilſt the ligneous acid, at beſt a weak one compared with the mineral acids, is in great meaſure deſtroyed by burning, and is ſo diſ-

* Portfire is made of one half ſulphur, one fourth nitre, and as much charcoal.

† Vid. Chiſholm on the Weſt India Fever.

‡ By ſmoaking this ſhip (Revenge) well with the vapour of tar, the infection had abated. Vid. Lind, p. 2.

fuſed

fuſed in the vapour of boiling tar, as to prevent entirely any effect which this acid, in a more concentrated ſtate, might otherwiſe produce.

Burning tobacco.—There is an antient prejudice reſpecting the antipeſtilential quality of tobacco, founded, I believe, on a tradition which is entirely void of truth, that the plague never entered a tobacco ſhop. Dr. Lind however ſeems to have had a high opinion of it*, but upon what this was founded I cannot pretend to ſay, as the ſmoak of tobacco, ſo far as I can perceive, has no advantage over the ſmoak of any other vegetable matter.

Burning wood.—The ſmoak † of a wood fire was reckoned, by Dr. Lind, one of the moſt

* When priſoners can be removed, the infection will moſt effectually be extinguiſhed by their removal to another priſon, and, after thoroughly cleaning the infected one, to fumigate with the ſmoak of tobacco, &c. Vide Dr. Lind's Health of Seamen, p. 337.—Dr. Lind had ſo high an opinion of the power of tobacco, that he adviſed the buying up all the damaged tobacco, to be employed for this particular purpoſe.

† A judicious application of fire and ſmoak, is the true means appropriated for the deſtruction and utter extinction of the moſt malignant ſources of diſeaſe. Again. It hath

moſt powerful means of deſtroying contagion, and he gives ſeveral examples where it was ſucceſsfully employed. I might perhaps remark that ſome of theſe examples he had from perſons who were not ſuch accurate obſervers as himſelf; I ſhall not however call them in queſtion, as I think the advantage ſuppoſed to be immediately derived from the ſmoak of wood, may fairly be aſcribed to other cauſes. In the firſt place, the ſmoak of wood conſiſts principally of ſoot, or of inflammable matter unconſumed, with ſome carbonic acid, neither of which can have any effect on contagion; whilſt the ligneous acid is in very ſmall quantity, too ſmall certainly to be of much ſervice. But we know, that where there is ſmoak there is heat, and that where there is much ſmoak, in places where people are preſent, a free admiſſion muſt be given to the air; two circumſtances which have conſiderable influence in weakening the

been experimentally found, that the ſmoak of a wood fire ſerves not only to leſſen the force or violence of ſuch poiſons, but is alſo an excellent protection againſt their being conveyed. Vide Lind's Papers on Fevers and Infection. Paper 1. p. 49.

virulence,

virulence, and in preventing the ſpreading of contagion.

Boiling vinegar. — Vinegar * has, at all times, been conſidered as the grand antidote to contagion, though I believe it to be one of the moſt trifling means that has ever yet been employed. I have never once obſerved the ſmalleſt benefit from its uſe; and have known many fatal examples of contagion having been communicated where it was conſtantly employed. But although the ſteam of boiling vinegar can be of no advantage in deſtroying contagion, yet, as the ſmell of it is grateful to the ſick, it may for that reaſon be uſed about their perſons; and when camphire is diſſolved in it, the ſmell is ſtill more agreeable and reviving.

Waſhing the furniture, floors, walls, &c. with vinegar, I conſider as little better than waſhing them with ſimple water. The ſame may be ſaid of white-waſhing, as the lime

* The caſcarilla bark, when burning, gives a moſt agreeable ſcent to the chambers of the ſick, and ſo is at leaſt an excellent preſervative, and may prevent bad ſmells from taking effect. The ſteam of boiling camphorated vinegar is ſtill more powerful for this purpoſe. Vide Lind on Fevers and Infection. p. 51.

and ſize can have no particular effect. Oil-painting, another mode of purifying apartments, has little advantage over the preceding; not to mention the expence and inconvenience attending it.

But enough has been ſaid to ſhew the general want of chemical knowledge, apparent in all the methods hitherto propoſed for deſtroying contagion, and more eſpecially, the inefficacy of the methods employed in places and ſituations from which people could not be removed; I ſhall now proceed to a more agreeable taſk, and explain thoſe improvements, which a more accurate chemiſtry, and a long attention to the ſubject, have ſuggeſted to me, and relate ſome experiments which I made, with a view to aſcertain the efficacy of the nitrous acid, and the ſafety with which it may be uſed, where people are neceſſarily preſent.

The mineral acids, particularly when in a ſtate of vapour, with the different gaſes or permanently elaſtic fluids produced by them, are probably, excepting fire, the moſt powerful agents in nature, and the ſource of an infinite number of the different forms of matter

obſerv-

obſervable in the mineral kingdom, and which are conſtantly undergoing freſh changes, from their various combinations, and decompoſitions. But their power is not confined to the mineral kingdom; they are known to have great influence likewiſe over putrefaction, and thoſe other ſpontaneous changes which vegetable and animal matter, deprived of life, undergoes; and therefore, if the jail contagion, as I have endeavoured to prove, is a vapour produced by putrefaction, there cannot be a doubt that the mineral acids will prove effectual in deſtroying it. So far we may reaſon *a priori*; but let us next conſult experience, a leſs fallible guide. From this it appears, that the volatile vitriolic or ſulphureous acid, the only one hitherto made uſe of, proves effectual in deſtroying contagion; although, owing to its deleterious quality, it cannot be employed, except in ſituations from which people can be removed. But, are the other mineral acids in a ſtate of vapour equally dangerous with the ſulphureous? and, are they equally effectual in deſtroying contagion? To the firſt of theſe queſtions I can give a poſitive anſwer; to the ſecond I can give one that, at leaſt, is highly probable.

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In the firſt place, I can ſafely affirm, that the nitrous acid may be employed in very great quantity without riſk, and even without the ſmalleſt inconvenience; and, that it is effectual for the deſtroying of contagion, I have every reaſon to believe, not only from analogy, but from experience. I had frequently uſed the nitrous acid, as a fumigation, in hoſpital wards, and in the private apartments of the ſick, without perceiving any unpleaſant effect from it; but, to aſcertain with more preciſion a fact of this importance, I made the following experiments; in the conducting of which, Mr. Hume of Long-acre, a very ingenious man, and an excellent chemiſt, was ſo obliging as to favour me with his aſſiſtance.

We put a mouſe, confined in a wire trap, under a glaſs cylindrical jar, capable of holding about 25 pints beer meaſure, or 881 cubic inches; the jar was inverted upon wet ſand, contained in a flat earthen trough or pan; it was then filled with the fumes of the ſmoaking nitrous acid, introduced by means of a crooked glaſs tube, until the animal could not be very diſtinctly perceived. The mouſe was kept in this ſituation for a quarter

of

of an hour, when the jar was removed, and the animal expoſed to the open air; it immediately ran about the wire trap, as uſual, and had not the appearance of having ſuffered the ſlighteſt inconvenience from its confinement. After a few minutes, the mouſe was again put under the glaſs jar, which was now filled with the vapour of pure nitrous acid, detached from nitre by the vitriolic acid. It remained much about the ſame time as before, and when the jar was removed, ſeemed perfectly well.

We repeated the ſame experiments with a green-finch, only with ſome little variation in the manner. We placed, on a table covered with green baize, a brown earthen veſſel or pan, containing heated ſand; in this was put a glaſs ſaucer, with about half an ounce of ſtrong vitriolic acid; above which we placed the bird-cage, ſupported with ſome ſmall pieces of wood laid acroſs the pan; then, adding a drachm or two of nitre, in powder, to the vitriolic acid, we covered the whole with the glaſs jar. The nitrous acid roſe in ſuch quantity, that, in a very little time, the bird ſeemed as if in a cloud or fog. We kept it in this ſituation fifteen minutes,

by

by which time the cloud had diſappeared, and the acid was in part condenſed on the ſide of the glaſs jar; during the whole time the bird neither panted, nor appeared to ſuffer any uneaſineſs, from the atmoſphere in which it was confined. We made trial alſo of the marine acid, by adding common ſalt, inſtead of nitre, to heated vitriolic acid: during this experiment, the bird appeared to be, now and then, ſomewhat uneaſy, and opened its bill; but, at the end of fifteen minutes, upon removing the jar, it hopped about as lively as before. We then expoſed the bird to the fumes of ſulphur, burnt with an eighth part of nitre; it immediately gave ſigns of uneaſineſs, opened its bill, and ſeemed to pant for breath in ſuch a manner, that we were afraid to cover it with the glaſs jar. We likewiſe made trial, in the open air, of the oxygenated marine acid*; for,

* The oxygenated marine acid is a diſcovery of the famous Scheele, and has been recommended by Berthollet and Chaptal, two French chemiſts, for the purpoſe of bleaching. I am informed that it has alſo been lately uſed in France to deſtroy contagion, but the particular circumſtances, and manner of its application, I have not yet learnt.

as this is ſo extremely deleterious, we did not think it ſafe to expoſe ourſelves to the vapour of it in a room, nor did we venture to expoſe the bird to it in any other way but in the open air, and even there it appeared to ſuffer very much.

Having made trial of the effect of the different mineral acids, in a ſtate of vapour, upon animals, we determined to render the experiment ſtill more concluſive, by trying what effect they would have on ourſelves. With this intention, we filled the room * in which we were with the fumes of nitrous acid, (obtained by mixing nitre with heated vitriolic acid, in the manner already deſcribed) until the different objects became ſomewhat obſcure, by a kind of fog or miſt produced. The fire irons and ſteel fender, loſt their poliſh, and the vapour ariſing from a bottle of aqua ammoniæ puræ, placed at ſome diſtance from the table, was evidently neutralized, as it iſſued from the bottle, by the vapour of the nitrous acid.

* The room in which we made the experiments was a ſmall parlour 13 feet by 10, and 8 feet high; or about 1040 cubic feet.

Mr.

Mr. Hume and I remained in the room the whole time, without perceiving the ſlighteſt inconvenience; the fumes did not excite coughing, nor affect the eyes, in the way the ſmoak of wood commonly does, even when I held my head over the glaſs faucer, and breathed them immediately ariſing from it. We made trial likewiſe of the effect of the marine acid, which we found more pungent and ſtimulating than the nitrous; but, though it excited coughing, it did not cauſe that conſtriction of the windpipe, and tightneſs at the cheſt, with the ſenſe of ſuffocation, which is immediately induced by the volatile vitriolic or ſulphureous acid. Indeed we were imprudent enough to try how far we could breathe this laſt, but I was inſtantly obliged to run to the window for air, from the ſenſe of conſtriction, and of ſuffocation, which it occaſioned. We likewiſe tried the effect of the mixed fumes of the marine and nitrous acid, a kind of volatile aqua regia, which we found more pungent than the marine acid by itſelf. As for the oxygenated marine acid, perceiving the effect of it on the bird, and knowing how extremely dangerous

gerous it is, we did not venture to go very near it.

From the preceding experiments, the different acid vapours, in reſpect to the ſafety with which they may be breathed, may be arranged in the following order:

1ſt. The vapour of nitrous acid, ariſing from nitre decompoſed by vitriolic acid.

2. Ditto—of nitrous acid in its fuming ſtate, or when the nitric acid is mixed with nitrous gas.

3. Ditto—of marine acid, ariſing from common ſalt, decompoſed by vitriolic acid.

4. Ditto—of nitrous and marine acids, obtained from the decompoſition of nitre and common ſalt by vitriolic acid.

5. Ditto—of ſulphur, burnt with an eighth part of nitre.

6. Ditto—of ſulphur, burnt with charcoal.

7. Ditto—of oxygenated marine acid *, obtained

* The oxygenated marine acid is obtained, by diſtilling marine acid from manganeſe, but may alſo be procured in ſmall quantity, by putting manganeſe to heated marine

tained by putting manganeſe to marine acid.

As the firſt vapour is perfectly harmleſs, in any quantity in which it may be required, it is evidently the moſt proper to be employed in all ſituations where people are neceſſarily preſent; and if it ſhould prove efficacious in deſtroying contagion, of which I have not the ſmalleſt doubt, it is the *deſideratum* *, ſo much ſought after by Dr. Lind; but which he confeſſes, with his uſual candour, he never could find out.

The ſecond, though more pungent than the firſt, may I believe be employed with the greateſt ſafety; at leaſt, I have never obſerved any inconvenience from uſing it. But, as it cannot ſo eaſily be procured in conſiderable quantity, and is attended with greater inconvenience and expence, I have of late years only made uſe of the firſt.

marine acid, or by gradually adding a mixture of manganeſe and ſea-ſalt to heated vitriolic acid.

* A certain method therefore of deſtroying infection in places from whence perſons cannot be removed, is a *deſideratum* not yet obtained in phyſic. I have propoſed and tried many things for this purpoſe without ſucceſs. Vide Lind's Obſervations on the Jail Diſtemper. Edit. publiſhed in Oct. 1779.

Our

Our experiments likewiſe warrant us to affirm, that the third, or marine acid, though more ſtimulating, and more apt to excite coughing, than the nitrous, may be ſafely uſed, at leaſt in a moderate quantity, where people are preſent; and where nitre cannot be had, I ſhould have no heſitation in employing it.

Of the fourth I can ſay but little, only that, in breathing it, I perceived it more pungent than the pure marine acid; and therefore, unleſs it ſhould be found to poſſeſs ſuperior efficacy in deſtroying contagion, I would not employ it where there are people preſent.

As the fifth never can be uſed with ſafety where there are people preſent, its uſe muſt be ſolely confined to fumigating empty apartments, clothes, furniture, &c.

The ſixth ſhould never be employed, as the carbonic acid may do harm, and never can have any effect on contagion.

Of the ſeventh I have no particular knowledge, only that it is extremely deleterious, and I believe extremely powerful; but whether it has more effect on contagion than the

other mineral acids, experience only can determine.

Having now fully proved that the nitrous, and poſſibly alſo the marine acid, obtained in the manner already deſcribed, may be employed with perfect ſafety in hoſpital and priſon wards, whilſt the people remain in them, I ſhall, in the next place, relate how far my experience goes to aſcertain the efficacy of thoſe acids in deſtroying contagion.

From all the information I can procure, I do not find that any perſon has ever made uſe of the nitrous acid to deſtroy contagion but myſelf; for, as this acid is not produced by the deflagration of nitre, or of gunpowder, the employment of theſe cannot be conſidered as an inſtance to the contrary. I formerly mentioned, that I had employed the nitrous acid in two different forms; either the vapour ariſing from the yellow or ſmoaking nitrous acid, which is a mixture of the acid with nitrous gas, or the more pure nitrous acid, detached from nitre, decompoſed by the vitriolic acid. In one or other of thoſe forms I have uſed it, both in hoſpitals and in private practice, for ſixteen or ſeventeen years paſt; and have had the ſatisfaction

faction to obtain the moſt deciſive evidence of its happy effect, in preventing the ſpreading, or farther communication, of contagion.

The moſt highly contagious fevers that occur in our hoſpitals, do not affect the patients in general lodged in the ſame ward, but only the nurſes, or thoſe patients who aſſiſt them, or thoſe who lie in the beds contiguous to the ſick; to ſuch perſons I have frequently ſeen the fever communicated, and have alſo repeatedly prevented the farther ſpreading of the diſeaſe, by placing gallipots, with the fuming nitrous acid, between the beds of the ſick and of thoſe who were not yet affected by the contagion. And, in private practice, I can declare with truth, that where the nitrous acid has been conſtantly uſed as a fumigation, I have not known an inſtance of a contagious fever having been communicated, even to a nurſe or an attendant.

Theſe facts will, undoubtedly, be allowed to be very ſtrong evidence, with reſpect to the power of the nitrous acid to deſtroy contagion; ſtill, however, they are liable to ſome uncertainty, and I will freely confeſs, that the effect of the nitrous acid, for this

purpoſe, cannot be ſaid to be fully proved, until it has been tried in fumigating tainted clothes, &c. and until its power has been found ſufficient to deſtroy contagion on board of ſhips, and in priſons and hoſpitals, where it exiſts in a much higher degree than I have had occaſion to ſee it, excepting at Winchester.

It will probably be aſked, why I did not make a complete trial of it there? To this I anſwer, that with reſpect to fumigating infected clothes, bedding, &c. I did not think myſelf warranted, eſpecially on an occaſion of ſo much importance, to make trial of an uncertain remedy, when a certain one was in my power. As to fumigating the priſon and hoſpital wards, it was evidently my intention to have employed the nitrous acid, but I was miſtaken in the means I took to procure it, and have not ſince had a proper opportunity of repeating the experiment.

The effect of the marine acid, in a ſtate of vapour, on contagion, I have not yet had occaſion to try, but have no doubt that it will be found of ſufficient efficacy for deſtroying it; and, from the foregoing experiments, it is evident that, though not ſo mild

or

or ſafe as the nitrous acid, it may be uſed, in a moderate quantity, even where people are preſent. The only purpoſe to which I have applied it, has been, when properly diluted, to waſh the hammock poſts, bedſteads, and furniture; alſo the floors, and walls, of the apartments of the ſick *: and I am perſuaded that, even in this way, it was extremely ſerviceable, certainly more powerful than the moſt concentrated vinegar.

I ſhall now conclude this ſubject with a few practical rules or obſervations, which may be looked upon as corollaries, or inductions, from the preceding experiments.

The well known efficacy of the ſulphureous acid, in deſtroying contagion, is a ſufficient reaſon for our continuing to uſe it as a fumigation for clothes, furniture, &c.

The nitrous acid, being attended with no riſk or inconvenience to the reſpiration, and

* The waſhing the hammock poſts, walls, and floors of the priſon wards with the diluted marine acid, and the removal of all clothes, bedding, &c. proved completely effectual for deſtroying the contagion at Wincheſter; as it is now apparent, that the burning or deflagrating of nitre could contribute nothing to the ſucceſs.

appearing, from our experience, of ſufficient efficacy to prevent the farther ſpreading of contagion, ſeems the proper antidote to be applied, in all ſituations where perſons are neceſſarily preſent, and is, in ſhort, the *deſideratum* ſought after by the benevolent Dr. Lind.

For purifying empty hoſpital or priſon wards, and ſhips, I ſhould alſo prefer the nitrous acid to the ſulphureous; as I believe it to be equally efficacious; its vapour is more volatile and penetrating; and it does not leave the diſagreeable ſmell which ſulphur does. But, for this particular object, I think it would be adviſeable to make trial alſo of the marine acid, and of the mixture of nitrous and marine acids, as I am convinced of the efficacy of all the mineral acids for deſtroying contagion, and our experience is not yet ſufficient to determine their relative advantages, and diſadvantages.

To obtain the nitrous, or marine acid, in a ſtate of vapour, the method is extremely ſimple. It conſiſts in decompoſing nitre, or common ſalt, by means of heated vitriolic acid, which may be done as follows:

Put

Put half an ounce * of vitriolic acid into a crucible, or into a glaſs or china cup, or deep ſaucer; warm this over a lamp, or in heated ſand, adding to it from time to time ſome nitre or common ſalt: theſe veſſels ſhould be placed at twenty or thirty feet diſtance from each other, according to the height of the cieling, or virulence of the contagion. In hoſpitals, or priſons, the lamps, or veſſels containing heated ſand, may be placed on the floor; on board of ſhips, it will be better to hang them to the cieling by waxed ſilk cords. The fumigating lamps, which I have ſeen at Moyſer's, in Greek-ſtret, Soho, a great number of which I was told have been ſold to the navy, may be employed for this purpoſe; although they would anſwer much better, if the ſaucer was deeper, and if, inſtead of a place for a lamp, there was a box proper for containing hot ſand, in which the ſaucer might be placed.

* As the quantity of vapour depends, in ſome meaſure, on the ſurface, I think it better to have the vitriolic acid put in a number of ſmall veſſels, than in one or two large ones; beſides, in this way, it has the advantage of being diffuſed more readily in any given ſpace.

As fumigating with nitrous acid is attended with no inconvenience, and as the proceſs is ſo ſimple, and the materials ſo cheap, it ſhould, as a means of prevention, be employed for ſome hours every day in tranſports having troops on board, and in crouded hoſpitals; and, if there is any appearance of contagion, the fumigation ſhould be executed with more care and attention, and the vapour confined for ſeveral hours at a time. Fumigating veſſels, or lamps, ſhould alſo be placed contiguous to the hammocks, or beds, of perſons affected with any contagious or putrid diſtemper, whether fever or dyſentery.

By taking ſuch precautions, a great deal of miſchief would probably be prevented, and a ſtop put, in the beginning, to one of the moſt fatal calamities * that ever afflicted mankind.

* The late dreadful mortality in the Weſt-India iſlands, occaſioned by a contagious fever imported from Boulam, has made too deep an impreſſion on the minds of the people of this country to be ſoon forgotten, and every exertion on the part of the executive government will no doubt be made to prevent a repetition of the ſame tragedy.

SINCE writing the above, I have had the pleaſure of ſeeing the laſt publication, and, as I imagine, the lateſt improvements, of the French chemiſts and phyſicians on the ſubject of contagion, and on the proper means of deſtroying it. It is intitled, "*Inſtruction, "ſur les moyens d'entretenir la ſalubritè, et de "purifier l'Air des Salles, dans les Hopitaux "militaires de la Republique, fait au Conſeil "de Santé le 5 Ventoſe, l'An 2d de la Repub-"lique francaiſe une et indiviſible.*"

This *inſtruction*, or *memoire*, is divided into three parts. The firſt relates ſolely to the means of cleanlineſs; the ſecond to what are called the mechanical means; and the third to the chemical. The two firſt parts contain nothing new or intereſting; the third is of the greateſt importance to medical ſcience, and particularly ſo to me, as it furniſhes a proof of the accuracy of ſome of the preceding experiments, and is a complete confirmation of the opinions I have long entertained reſpecting the nature of contagion, and the power of the mineral acids to deſtroy it.

The

The French phyſicians, inſtructed by that excellent chemiſt *Le Citoyen* Guiton, better known by the name of Monſ^r. de Morveau, of Dijon, have lately made trial of the marine acid in their hoſpitals, and have found it equally effectual in deſtroying contagion as the ſulphureous, and, as being more volatile, perhaps even preferable for the purpoſe of purifying hoſpital wards. They alſo remarked that, in a ſmaller proportion, it may be ſafely uſed in hoſpital wards, even when people are preſent *. The French phyſicians however have not employed the nitrous acid, nor made any trials of its effect on contagion; neither do they appear to have ſuſpected that the power of deſtroying contagion was a quality inherent in all mineral acids; and probably, to a certain degree, in all acids, under certain circumſtances. Although their experience of the effect of the marine acid, together with my obſervations on that of the nitrous, ſeem to eſtabliſh the fact beyond the cavil of ſcepticiſm itſelf.

Their method of obtaining the marine acid is the ſame that I took to procure the

* My experiments ſhewed the ſame thing.

nitrous;

nitrous; they either employed the fuming marine acid, or the acid detached from its alkaline baſis by vitriolic acid, uſing a conſiderable degree of heat for that purpoſe *. They likewiſe, upon the ſuggeſtion of M. Fourcroy, recommend adding a ſmall quantity of the oxygenated marine acid; but, as they do not pretend to ſay that they have had any experience of the ſuperior efficacy of this, and as the common marine acid has been found to anſwer the purpoſe, I do not ſee any reaſon for making ſo hazardous an addition.

Another chemical proceſs for putrifying foul air in hoſpitals, recommended in this *inſtruction*, deſerves our notice. It conſiſts in placing, at different diſtances in the hoſpital wards, veſſels with lime water, for the purpoſe of abſorbing carbonic acid or fixed air. I am inclined, however, to believe, that this advice is more the reſult of chemical theory than of practical obſervation; for I do not ſuppoſe that carbonic acid is ever preſent, (where there is a free admittance of air,) in ſufficient quantity to prove hurtful;

* The reader will find at the end an account of their proceſs.

at

at leaſt, it can only affect the breathing, and has nothing in common with contagious vapour.

The French phyſicians appear to me to have fallen into a conſiderable miſtake on this ſubject, in taking the quantity of carbonic acid preſent *, in an hoſpital, as a teſt of the quantity or malignity of contagion, when, in reality, they are two things totally diſtinct from each other. The firſt, or carbonic acid, is a conſtituent part of the common or atmoſpheric air, which is greatly increaſed by the reſpiration of animals, and by burning candles, lamps, &c. and, when in too great quantity, extinguiſhes flame, and animal life: the other has no relation with the compoſition of the atmoſphere, never affects reſpiration, but is produced by putridity, and excites fever.

* The method propoſed by the French phyſicians, for aſcertaining the quantity of carbonic acid preſent, is ſimple and ingenious. Take two phials; let one be filled with common water, the other with lime water. At the place where you want to try the purity of the air, empty the phial of common water, then, filling it half full with lime-water, and corking it, ſhake the phial for ſome time: the quantity of ſediment ſhews the proportion of carbonic acid. But, to render the preceding experiment concluſive, the height from the ground at which the air is taken ſhould be ſtated, otherwiſe we are liable to great fallacy.

Extract

Extract from the "*Inſtruction, ſur les Moyens*
"*d'entretenir la ſalubrité, et de purifier*
"*l'Air des Salles dans les Hopitaux Mili-*
"*taires de la République, &c. &c. &c.*"

"*Au nombres des moyens que la chimie a*
"*employés avec un ſuccès que tient du prodige*
"*pour operer cette depuration, nous citerons le*
"*procedé que Guiton, (Monſ. de Morveau)*
"*repreſentant du peuple, a mis en uſage*
"*en* 1773, *dans la ci-devant cathedrale de*
"*Dijon, infectée par des exhumations, au*
"*point qu'on fut obligé de l'abandonner.*

"*Ce moyen conſiſte à répandre dans l'atmoſ-*
"*phere, de l'acide muriatique (acid marin) en*
"*etat de gaz degagé par l'intermède de l'acide*
"*ſulphuric; (huile de vitriol) voici le procédé*
"*pour déſinfecter une ſalle de* 40 *a* 50 *lits.*

"*Après avoir évacué les malades ſur une des*
"*ſalles de rechange, diſpoſéz dans le milieu de*
"*la ſalle vuide, dont les fenêtres & les portes*
"*feront fermées, un fourneau garni d'une*
"*petite chaudière ou capſule de fer, à demi*
"*remplie de cendre tamiſée ſur laquelle on poſera*
"*une capſule de verre de grès, ou de fayance*
"*même, chargée de neuf onces de muriate de*
"*ſoude,*

" *ſoude, (ſel marin,) legérement humecté avec*
" *une demi-once au plus d'eau commune. Le*
" *feu étant allumé à la capſule echauffée, on*
" *verſera ſur le ſel marin quatre onces d'acide*
" *ſulfurique, huile de vitriol de commerce. En*
" *un inſtant l'acide ſulfurique agira ſur le ſel*
" *marin, dont l'acide ſe mettra en expanſion;*
" *l'operateur, qui ſera le pharmacier en chef,*
" *ou un de ſes aides, verſé dans le manuel des*
" *operations chimiques, ſe retirera, en fermant*
" *la porte ſur lui, et emportant la clef; douze*
" *heures après on entrera dans la ſalle, on*
" *ouvrira portes et fenêtres, pour établir des*
" *courans d'air, et évacuer celui qui pourroit*
" *être encore chargé d'acide. On donnera une*
" *une plus grande latitude d'utilité à ce pro-*
" *cédé en l'appliquant aux ſalles même remplies*
" *de malades, toutes les fois que les officiers de*
" *ſanté le jugeront neceſſaire. Ainſi lorſqu'on*
" *aura reconnu que l'air d'une ſalle eſt ſur-*
" *chargé de miaſmes animaux, et a beſoin de*
" *cet excellent purificateur, il ſuffira de faire*
" *le tiers du melange ci deſſus, et même moins,*
" *et de la parcourir plus ou moins lentement,*
" *et dans tout les points, le rechaud à la main,*
" *au moment où le gaz ſe met en expanſion.*

" *Lorſque*

" *Lorſque la ſalle ſera jugée ſuffiſamment*
" *rempli de gaz acide muriatique, on tranſpor-*
" *tera l'appareil dans les latrines, afin que les*
" *dernières portions gazeuſes que le mêlange*
" *pourra continuer de fournir ſervent à neu-*
" *tralizer les gaz ammoniacaux putrides, qui*
" *ſe developpent continuellement dans les privés.*

EXPE-

EXPERIMENT

MADE WITH THE

NITROUS FUMIGATION

ON BOARD THE

UNION HOSPITAL SHIP,

&c. &c. &c.

THE RIGHT HONOURABLE

EARL SPENCER,

&c. &c. &c.

MY LORD,

THE general opinion entertained of your Lordſhip, in the high department, at the head of which you are placed, is the only apology I can offer for having taken the liberty to trouble you on the ſubject of my late publication. The immediate attention paid to this by your Lordſhip, and by the reſt of the Lords Commiſſioners of the Admiralty, is extremely flattering to me, as an individual, and claims my warmeſt gratitude; but it is of much more importance, my

Lord, as holding out to the nation, a well grounded confidence, that no object which may be conducive to the public ſervice, or to the preſervation of thoſe brave men, the pride and protectors of their country, can long eſcape your Lordſhip's notice. I have now the honor to lay before you, and the reſt of the Lord's Commiſſioners of the Admiralty, an account of the Experiment made on board the Union, at your Lordſhip's deſire, and likewiſe of thoſe trials that were made at the deſire of the Ruſſian Admiral, and with your Lordſhip's approbation, on board ſome ſhips of his ſquadron. I conſider myſelf, in executing this taſk, as only performing a duty I owe to your Lordſhip, and which I do with the greater pleaſure, as it may poſſibly be the means of making public a diſcovery which ſhould be univerſally known; and as the only way in my power to bring forward the merit of thoſe Gentlemen, to whoſe aſſiſtance I have been particularly indebted for the fortunate iſſue

of

of this experiment, and from whoſe reports I am enabled to preſent your Lordſhip with an account of the manner in which it was conducted, and of the particular effects it produced.

Mr. Menzies, late Surgeon to his Majeſty's ſloop the Diſcovery, was the perſon who, at my requeſt, very obligingly undertook the management of the experiment on board the Union, and it is but doing him juſtice to ſay, that I could not have found a gentleman better qualified, in every reſpect, for executing ſo important a truſt. I ſhall therefore, my Lord, without farther preface, lay before you, and the reſt of their Lordſhips, Mr. Menzies's journal, as affording a better deſcription of the experiment, ſo long as he continued to conduct it, than any I can offer.

REPORT

OF THE

EXPERIMENT

FOR

Stopping the Progreſs of Contagion, *as executed on board the Union Hoſpital Ship, at Sheerneſs, by Mr. Arch. Menzies.*

DOCTOR James Carmichael Smyth having been requeſted, by the Lords Commiſſioners of the Admiralty, to ſend a perſon on board the Union Hoſpital Ship, laying at Sheerneſs, to make trial of the effect of a fumigation of the Nitrous Acid, and of other means recommended by him in a late publication, for deſtroying Contagion, I readily

engaged, upon application being made to me by ſome of our common friends, in the execution of an experiment which I foreſaw might eventually be of much benefit to ſociety, and particularly to that ſervice, to which I have the honor to belong.

After having, therefore, received inſtructions, and obtained every neceſſary information on the manner of conducting the fumigation, I left London on the 24th of November, 1795, and arrived at Sheerneſs the ſame evening.

Next morning I waited on Admiral Buckner, the commanding officer of the port, whoſe politeneſs and zeal to promote the object of my journey, were equally conſpicuous, and deſerves my moſt grateful acknowledgement.

I afterwards went on board the Union, where I produced the orders of the Admiralty to Lieutenant Quarme, the commanding officer, and Mr. Baſſan, ſurgeon of the ſhip, who received me with cordiality, and readily offered every aſſiſtance in their power to carry on the experiment, upon the event of which not only the ſafety of the ſhip's company, but, perhaps, their own, in great meaſure, depended.

On

On examining the ſtate of the hoſpital, I plainly foreſaw that freſh contagion would be daily pouring into it from the Ruſſian veſſels, under which diſadvantageous circumſtance, it would be difficult to decide on the ſucceſs of our endeavours. The lower and middle gun-decks were divided into large apartments, or wards, by croſs partitions, with a free communication between each *: they were extremely crouded, and the ſick of every deſcription lay in cradles, promiſcuouſly arranged, to the number of nearly two hundred; of which about one hundred and fifty were in different ſtages of a malignant fever, extremely contagious, as appeared evident from its rapid progreſs, and fatal effects, amongſt the attendants on the ſick, and the ſhip's company. For, from the beginning of September laſt, when the Ruſſian ſick were firſt admitted into the hoſpital; eight nurſes and two waſher-women had been attacked with this fever, and of theſe three had died. About twenty-four of the ſhip's company had likewiſe been ill of the ſame diſ-

* To give a more exact idea, I refer to the drawing of the ſhip which accompanies this journal.

order,

order, and of theſe a ſurgeon's mate and two marines died. Upon the whole, however, the mortality had not been ſo great as there were reaſons to dread, from the virulence of the contagion, and malignity of the diſeaſe; which can only be aſcribed to the great care and attention of Mr. Baſſan, ſurgeon to the hoſpital, whoſe conduct in ſo critical a ſituation does him the higheſt honor, and reflects luſtre on his profeſſional abilities, in the faithful diſcharge of ſo unpleaſant a duty.

After I returned on ſhore from the Union, I employed the reſt of the day in collecting and ſending on board ſuch utenſils and materials as were required for fumigating the ſhip; theſe conſiſted of a quantity of fine ſand, about two dozen quart earthen pipkins, and as many ſmall common tea-cups, together with ſome long ſlips of glaſs to be uſed as ſpatulas; the other materials I had brought with me from town, viz. the concentrated vitriolic acid, and a quantity of pure nitre in powder.

On the forenoon of the twenty-ſixth, I went again on board the Union. I firſt ordered all the ports and ſcuttles to be cloſe ſhut up; the ſand, which had been previouſly

ouſly heated in iron pots, was then ſcooped out into the pipkins by means of an iron ladle, and in this heated ſand, in each pipkin, a ſmall tea-cup was immerſed, containing about half an ounce of concentrated vitriolic acid, to which, after it had acquired a proper degree of heat, an equal quantity of pure nitre in powder was gradually added, and the mixture ſtirred with a glaſs ſpatula, until the vapour aroſe from it in conſiderable quantity. The pipkins were then carried through the wards, by the nurſes and convaleſcents, who kept walking about with them in their hands, occaſionally putting them under the cradles of the ſick, and in every corner where any foul air was ſuſpected to lodge. In this manner we continued fumigating, until the whole ſpace between decks was, fore and aft, filled with the vapour, which appeared like a thick haze.

I however proceeded in this firſt trial ſlowly and cautiouſly, following with my eyes the pipkins in every direction, to watch the effect of the vapour on the ſick, and obſerved that at firſt it excited a good deal of coughing, but which gradually ceaſed, in proportion as it became more generally diffuſed

fuſed though the wards; this effect appeared indeed to be chiefly occaſioned by the ignorance or inattention of thoſe who carried the pipkins, in putting them ſometimes too near to the faces of the ſick, by which means they ſuddenly inhaled the ſtrong vapour, as it immediately iſſued from the cups.

In compliance with Doctor Smyth's requeſt, the body-clothes and bed-clothes of the ſick were, as much as poſſible, expoſed to the nitrous vapour during the fumigation; and all the dirty linen removed from them was immediately immerſed in a tub of cold water, afterwards carried on deck, rinſed out, and hung up till nearly dry, and then fumigated before it was taken to the waſh-houſe: a precaution extremely neceſſary in every infectious diſorder. Due attention was alſo paid to cleanlineſs and ventilation.

As the people were at firſt very awkward and ſlow, it took us about three hours to fumigate the ſhip; in about an hour after, the vapour having entirely ſubſided, the ports and ſcuttles were thrown open, for the admiſſion of freſh air. I then walked through the wards, and plainly perceived that the air of

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the hoſpital was greatly ſweetened, even by this firſt fumigation.

Next morning the ſhip was again fumigated, beginning with the lower deck, and the people employed being now better acquainted with the operation, were more expert, and finiſhed the whole in about an hour's time; in an hour afterwards, the vapour having entirely ſubſided, the freſh air was freely admitted into the hoſpital.

This day the ſand was made hotter, and the fumigation was of courſe much ſtronger, yet the patients ſuffered no other inconvenience from it than a little coughing, and even that was not near ſo general as the day before.

Twelve pipkins were found ſufficient for fumigating the lower deck, ten for the middle gun deck, two for the ſhip's company's bed-room, two for the marines' bed-room, and one for the waſhing place; in all twenty-ſeven pipkins. Conſequently, about fourteen ounces of the vitriolic acid, and as much nitre, was expended in the forenoon; but, in the evening, as every place was ſo cloſe, and the freſh air could not be afterwards ſo freely admitted, it was not thought neceſſary

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to employ ſo many pipkins; ſo that little more than half the quantity of the fumigating materials uſed in the morning, was generally found ſufficient for the evening's fumigation.

The pleaſing and immediate effect of the fumigation, in deſtroying the offenſive and diſagreeable ſmell ariſing from ſo many ſick crouded together, was now very perceptible, even to the nurſes and attendants. The conſequence of which was, that they now began to place ſome degree of confidence in its efficacy, and approached the cradles of the infected with leſs dread of being attacked with the diſorder; ſo that the ſick were better attended, and the duty of the hoſpital was more regularly and more cheerfully performed. In ſhort, a pleaſing gleam of hope ſeemed now to caſt its cheering influence, over that general deſpondency which was before evidently pictured in every countenance, from the dread and horror each individual naturally entertained of being, perhaps, the next victim to the malignant powers of a virulent contagion.

On the twenty-eighth, the fumigation was repeated morning and evening, in the ſame

manner as on the preceding day, and with the ſame pleaſing effect, deſtroying the offenſive ſmell, and purifying the general air of the hoſpital. But there was, in particular places, a conſtant ſource of bad ſmell, which was not eaſily overcome, and which was occaſioned by the *neceſſaries*. Theſe were badly conſtructed, being placed within the ſhip, to the number of ſeven on the lower deck, and two on the middle deck, with ſmall funnels that pierced the ſides of the ſhip in a ſlanting direction, and generally retained the *ſoil*, unleſs where a perſon conſtantly attended to waſh it away, a very troubleſome and dangerous office, which chiefly fell to the lot of the nurſes, and doubtleſs tended to ſpread the contagion amongſt them.

I mentioned this nuiſance to the commanding officer, who told me that he viewed them in the ſame light, and that ſome alterations were making, which he hoped would remedy the evil. I therefore waited a few days the event of theſe alterations, before I ſhould make any public report on the ſubject.

For the following eight days I continued the fumigation on board the Union, regularly morning and evening, as already deſcribed,

ſcribed, without obſerving any particular occurrence different from what is already related, only that during this time, a conſiderable number of patients having been diſcharged from the hoſpital, all the ſpare cradles were ordered on deck, to be ſcrubbed and waſhed with the diluted marine acid, according to the particular directions of Dr. Smyth.

On the ſeventh of December, I reſigned to Mr. Baſſan the further proſecution of the experiment on board the Union hoſpital ſhip, but before I leave her, I muſt ſay, that it has already produced the moſt evident and beneficial effects, as not one of the attendants on the ſick, nor any of the ſhip's company have been attacked with the diſorder ſince I began the fumigation, with the exception of one nurſe, who ſuffered a ſlight relapſe from ſome imprudence; an accident which Mr. Baſſan informs me was very frequent in the beginning. And as none of the ſick, who have been brought to the hoſpital ſince my arrival, have died, it would ſeem that the fumigation has not only leſſened the danger of infection, but alſo the malignity of the diſeaſe.

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The proceſs of fumigating as already deſcribed, with the *nitrous acid*, is ſimple and eaſy, and although the vapour is extremely powerful and penetrating, the ſick of every deſcription were obſerved to bear it, with little or no apparent inconvenience, and to a much higher degree than I could have expected; and as it is found to purify the air from the diſagreeable effluvia, produced by ſo many people crouded together in a confined ſituation, it will be peculiarly advantageous on board of ſickly ſhips, where the crew, their clothes, and the ſhip, may be fumigated at the ſame time without any riſk from fire.

December 16, 1795.

On the ſixteenth of December, I again viſited the Union hoſpital ſhip, and found that the fumigation had been hitherto carried on regularly twice a day, and with the ſame evident advantages, in purifying the air of the hoſpital, and leſſening the malignity of the diſorder, ſo that every nurſe and attendant on the ſick, went now cheerfully and confidently about their duty; without the leaſt dread or apprehenſion of the contagion,

by which means the ſick were better taken care of, and the general ſtate of the hoſpital was in a much more proſperous way. It was therefore, from this time, deemed ſufficient to fumigate only once a day.

December 23, 1795.

On viſiting the Union again on the twenty-third of December, I found the carpenters employed, from the dock yard, in making the alterations which I formerly propoſed in a letter to Dr. Carmichael Smyth, reſpecting the *neceſſaries*, and which I was happy to find, the Lords of the Admiralty had ordered to be done upon his application.

My propoſal was to remove all the *neceſſaries* from the inſide, and have them rebuilt on the outſide of the ſhip, and by cutting down the lower edge of the ſame number of port-holes, to form entrances into them from the hoſpital, by which they would be equally eaſy of acceſs to the ſick, and the nuiſance would be totally removed. This I was happy to find the carpenters were now executing, and I am confident it will be attended with beneficial effects, by rendering the hoſpital much ſweeter, and conſequently more agree-

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able and healthy, both to the ſick and attendants.

ARCHIBALD MENZIES.

Mr. Menzies, as is already mentioned in his Journal, having, on the 7th of December, reſigned to Mr. Baſſan, ſurgeon of the Union, the management of the experiment, I muſt refer your Lordſhip, for the further detail of this buſineſs, to extracts taken from his letters, ſome of which you have already ſeen, and which are now arranged according to the order of time in which they were written.

Mr. Baſſan's conduct, my Lord, through the whole of this buſineſs, does him the higheſt honour, and cannot fail to recommend him to your Lordſhip's notice. When the contagion at firſt began to ſpread among the ſhip's company of the Union, he was importuned, by the warrant officers and others, to ſend them on ſhore to ſick quarters, which he peremptorily refuſed, ſaying, with the true ſpirit of a Britiſh ſailor: "It "is better we ſhould all periſh, than have "ſuch a contagious fever as this diſſeminated "in our fleet." He accordingly made ap-

plication to the Commander in Chief, and not a man was ſent out of the ſhip. His humanity and care of the ſick, Mr. Menzies mentions in the warmeſt terms of praiſe, and his ſucceſsful treatment of them, is the beſt teſtimony of his profeſſional abilities. His zeal and attention, in conducting the experiment, I ſhall always recollect with gratitude. He and Mr. Menzies were both of them ſtrangers to me until this occaſion brought us acquainted; but I muſt ſay, that in the whole circle of my acquaintance, I could not have found two more liberal or candid men.

Extracts of Mr. Baſſan's Letters to Dr. Carmichael Smyth.

Sheerneſs, December 4.

I beg leave to inform you, that we have continued to fumigate, in the manner directed, daily; and as only one Ruſſian has died ſince we began, I conſider that circumſtance as an early proſpect of our future ſucceſs.

—— *De-*

—— *December 7.**

The fumigation is not attended with the ſmalleſt inconvenience to any one, the majority of patients being in bed when it is done, and all of them in the wards; the cabins of the nurſes, privies, &c. are fumigated, as well as the apartments of the marines, and ſhip's company. For two months prior to the experiment, very few days elapſed without ſome of the attendants, or ſhip's company being ſeized with the fever; but ſince the 26th ultimo, the day on which Mr. Menzies began the fumigation, not one has been attacked with the diſeaſe: one nurſe only having relapſed, a circumſtance very common, and occaſioned by her not taking care of herſelf. I beg leave to inform you, that this day I began to take charge of the buſineſs, in the abſence of Mr. Menzies, who is on

* This letter, which by ſome accident was miſlaid, and conſequently not inſerted in the former edition, I have publiſhed in the preſent, as it renders his correſpondence compleat, and ſhews the unremitting attention of that worthy man, (whoſe ſervices the public have now unhappily loſt,) to every part of his duty.

board the Pamet Euſtaphia to try the experiment, (ſhe having been the moſt ſickly ſhip) where I am certain he will take ſuch meaſures, as will do himſelf credit, and you honour.

I intend in a few days, ſending you a journal from the 1ſt to the 26th of November, the day Mr. Menzies began in the Union, and another from the 26th ult. to the 11th inſt. containing the receipts, diſcharges, and deaths, by which you will be enabled to make a fair compariſon, much in favour of the means uſed, I am ſure. The dejection and melancholy occaſioned by the dread of the diſeaſe, prior to the commencement of the experiment, was evident in every countenance, and really affecting, and diſtreſſing; but the circumſtance of its being ſtopped at preſent, has diffuſed joy and chearfulneſs, and all look forward with the hopes and expectation of ſoon becoming a wholeſome ſhip. The ſymptoms of the fever are certainly much leſs violent, and at preſent, I have very few people in a dangerous ſtate.

—— *December* 9.

We continue to fumigate the ſhip as formerly; your other inſtructions ſhall be punctually adhered to.

—— *December* 11.

I yeſterday ſent you two liſts or journals, one of the Ruſſian ſick, and the other of perſons belonging to the Union, who have been attacked with the fever; from the laſt you will perceive that very few days elapſed from the firſt importation of the diſeaſe, to the 26th ult. without ſome one or other of the attendants, or ſhip's company, being ſeized with it; but ſince that period not one has been taken ill. I intend, very ſhortly, to ſend you a brief account of the diſeaſe, the ſymptoms of which are at preſent much meliorated. I believe that the fumigation has been of great ſervice to the ſick. We have very few patients at preſent who are not in a convaleſcent ſtate, and there is every proſpect that, through your aſſiſtance, we ſhall ſoon become a wholeſome ſhip.

—— *December* 15.

Since my laſt of the 11th inſt. I have re-received eighteen patients with the fever, none of which have died, although ſome of them were brought to the hoſpital in a ſtate of the utmoſt danger. The utility of the fumigation appears now very evident, as, notwithſtanding the great number of fever patients brought into this hoſpital ſhip, not one of the attendants, or ſhip's company, have experienced the ſlighteſt indiſpoſition ſince we firſt began to employ it.—A very ſatisfactory demonſtration of its power in deſtroying contagion; indeed, Sir, I moſt ſincerely congratulate you on the ſucceſs of a diſcovery, which promiſes to be of ſuch eminent ſervice to ſociety. Believe me, every thing ſhall be done, on my part, agreeably to your directions, to give it its full effect.

—— *December* 19.

The fumigation continues to demonſtrate its efficacy, as all the attendants, and ſhip's company, continue to enjoy perfect health, notwithſtanding I have lately received ſome

patients

patients with the contagious fever in as bad a ſtate as any I have ſeen; nor has a new nurſe, or any of the workmen, who are daily employed in the hoſpital making the propoſed alteration of the neceſſaries, ſuffered the ſlighteſt attack of the diſeaſe.—Mr. Menzies goes on with the Ruſſian ſhips, from which I hope ſoon to find the infection totally extinguiſhed.

—— *December* 21.

I am happy to inform you, that the contagion on board this ſhip appears to be nearly at an end, no one either of the attendants on the ſick, or of the ſhip's company, having been attacked with the fever ſince we began to fumigate, notwithſtanding we have received ſome patients in as bad a ſtate of fever, ſince that time, as any from the firſt importation of the diſeaſe. The people bear it exceedingly well, and I frequently ſtand in the midſt of a cloud, ariſing from the fumigation, as thick as a fog, without the ſmalleſt inconvenience, a circumſtance of great conſequence, as the ſick are all in the wards during the fumigation, and their clothes, &c. are conſequently impregnated with the acid

vapour,

vapour. In a few days we ſhall be able to aſcertain the ſucceſs on board the Pamet Euſtaphia, the only ſhip at this port in which the fever at preſent ſeems to prevail to any degree. I ſhall then conſider the experiment as compleat, and ſhall congratulate you on the ſucceſs of an invention, that, in all probability, will give you immortal honor, and which, from its public utility, you will ſo highly merit.

—— *December* 30.

Since my laſt, one nurſe and one marine have been taken ill of the fever, although the ſymptoms are evidently milder than heretofore. As it is impoſſible to ſay how long contagion may remain in an infected perſon before it is put into action, I am not at all diſcouraged by theſe two caſes; but ſhall continue every exertion in my power, in proſecuting the experiment, which has already been of ſuch eminent utility. I have received ſeveral patients from the St. Alexander Niewſki, and another Ruſſian ſhip, returned from ſea, five or ſix of them ill of the fever. I need hardly obſerve, that if you could by any means enforce the fumigating all the

Ruſſian

Ruſſian ſhips, as well as enjoin cleanlineſs, it would be of the utmoſt conſequence; and if you can ſend any perſon to aid me in the buſineſs, I ſhould be very glad; for though Mr. Menzies ſo ſtrongly recommended, to the Commanders, the neceſſity of continuing the fumigation, not one at Sheerneſs has made application to me for any materials for that purpoſe.

Extract of a Letter from Mr. Baſſan to Mr. Menzies.

Sheerneſs, December 30.

The Ruſſian ſhips which arrived this week from ſea, are ſickly. I received ſeveral with the petæchial fever, as bad as any I have ſeen; and am ſorry to ſay that nurſe Murray has had a ſlight attack, and one of the marines is at preſent ill of the ſame fever. He was taken ill on Tueſday morning, the ſymptoms are not ſo violent as formerly, and I ſhould double my attention in proſecuting the experiment which has already been of ſo much uſe.

TO DR. CARMICHAEL SMYTH.

Sheerneſs, January 4.

I cannot account for the contagion having produced the effects on the people mentioned in my laſt, otherwiſe than from the fumigation having been uſed the preceding week, only once a day, or from their having been infected prior to the commencement of it, which I think is not impoſſible. I am now determined to uſe it conſtantly twice a day, and have done ſo ſince Tueſday laſt, the day on which the marine was attacked; beſides, excluſive of the general fumigation, I place a fumigating pot or two in the wards near the worſt of the fever patients. The ſick not only bear the fumigation exceedingly well, but aid us voluntarily every day, the convaleſcents carrying the pipkins about, and expreſſing their conviction of its keeping the wards ſweet, which certainly it does, and thoſe perſons who have hitherto eſcaped infection, are ſo much convinced of its efficacy, and have ſo much faith in its power, that I ſhould find it difficult to diſcontinue the uſe

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of it, whilſt there is a ſick man on board. As a week has now elapſed ſince any perſon has been attacked with the diſeaſe, notwithſtanding we daily receive patients in the ſame putrid petæchial fever, from the ſhips lately arrived from ſea, I have every reaſon to expect our being once more a wholeſome ſhip. Be aſſured, Sir, that no pains ſhall be ſpared, on my part, to accompliſh ſo deſirable an object.

—— *January 7.*

I am happy to inform you that no perſon has been attacked with the putrid fever ſince my laſt, though we have received ſeveral ſick from the Ruſſian ſhips lately arrived from ſea.

—— *January* 13.

I am happy to acquaint you, that ſince we began again to fumigate the ſhip twice a day, no one has been attacked with the fever, although there are ſeveral carpenters at work in altering the neceſſaries, which are nearly compleated on the lower gun deck, and are to be altered immediately on the other deck.

I ſaw Captain Senevin, Commander of the Pamet Euſtaphia, the day before yeſterday, who

who informed me that he had continued the fumigation every day ſince Mr. Menzies's departure, and that he had now no ſick on board.

——— *February* 3.

I have the pleaſure to inform you, that the contagion ſeems now to be totally extinct, no one having been attacked with the fever ſince the 26th of December laſt, and only two ſince the 26th of November, the time when the fumigation was begun; one of theſe a marine, who, ten days previous to his being taken ill, had conſtantly drank very hard, and was often drunk; the other a nurſe, who was very ſlightly attacked, and both, in my opinion, might have received the infection long before it was put into action, as from their duty they were conſtantly expoſed to the contagion when it was firſt brought into the ſhip; and this is rendered ſtill more probable, as there have been ſeveral artificers at work, making the alteration in the privies, and of courſe amongſt the ſick, and likewiſe a freſh nurſe, a young woman immediately employed in the fever ward, none of whom have received the ſmalleſt injury. I there-

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fore now conſider the experiment as compleat, and can bring ſufficient evidence to convince any one that the contagion in the hoſpital, on board the Union, has, through Divine providence, been deſtroyed by the fumigation you recommended: beſides, as the acid vapour keeps the ſhip ſweet, it is my intention to continue it for that purpoſe conſtantly, if I am permitted ſo to do. The ſick bear it perfectly well, and, from its power in deſtroying alkaline vapour, it renders the air pure, and conſequently grateful both to the ſick and convaleſcents, as well as to thoſe whoſe duty it is to attend them. I moſt ſincerely congratulate you on the ſucceſs of this buſineſs,

And am,

Sir, &c.

A. BASSAN.

To the preceding account of the experiment on board the Union, I ſhall take the liberty, my Lord, to ſubjoin a brief deſcription of the trials made, at the requeſt of the Ruſſian admiral, and with the approbation of your Lordſhip, on board ſome ſhips of that ſquadron: and here I muſt again refer you to Mr. Menzies's journal.

REPORT

REPORT

OF THE

EXPERIMENT

FOR

Stopping the Progreſs of Contagion, *as executed on board ſome of the Ruſſian Men of War, by Mr. Arch. Menzies.*

SOON after my arrival at Sheerneſs, I had the honor of being introduced to his Excellency Admiral Hannikow, Commander of the Ruſſian ſquadron at that port, on which occaſion he was pleaſed to expreſs a particular deſire of having the moſt ſickly ſhips of his ſquadron purified by the ſame proceſs of fumigation, as I was then carrying on, on board

board the Union hoſpital ſhip. This being made known to the Lords Commiſſioners of the Admiralty, they were pleaſed to declare their approbation, by requeſting Admiral Buckner to confer with his Excellency on this ſubject: and on the twenty-eighth of November, it was agreed between theſe Commanders, that the fumigation ſhould be tried, under my directions, on board ſuch of the Ruſſian veſſels as were then moſt infected with the contagious fever, which had already proved ſo fatal to many of their crews; and it is but juſtice to ſay, that his Excellency, on this occaſion, ſhewed a particular zeal for its ſucceſs, by offering me every aid and aſſiſtance, and by aſſuring me of a ready compliance, with every means that might be ſuggeſted to accompliſh ſo deſireable an object, as the health and preſervation of thoſe under his command. But it ſo happened, that, on the day following, he was ordered, with part of his ſquadron, to the North Seas, and in this ſtate of hurry, not having time to conſider which was the moſt ſickly veſſel, he left orders for the trial to be made on board the Revel frigate; but on examining the hoſpital books on board the Union, the Pamet

Euſtaphia, of 74 guns, appeared to claim our firſt attention, from her ſickly ſtate: I therefore waited on Admiral Ruckner, to acquaint him with this circumſtance, and he very readily applied to Capt. Chechagoff, on whom the command of the remaining part of the Ruſſian ſquadron had devolved, and obtained his leave for the trial to be made on board of her, in preference to the other. After this, ſome unavoidable delay was occaſioned, in waiting for the materials, and collecting together the utenſils neceſſary for the operation.

In the forenoon of the ſeventh of December, 1795, I went on board the Pamet Euſtaphia, and having ordered the ports, ſcuttles, and hatchways to be cloſe ſhut up, with the ſhip's company between decks, we fumigated her for the firſt time, and continued it morning and evening on the following day, in the ſame manner that we had done the Union hoſpital ſhip.

This ſhip has of late ſent more ſick with the malignant fever to the hoſpital, than all the reſt taken together, of the Ruſſian ſquadron laying at this port, which her Commander, Capt. Sinavin, attributes in a great meaſure

meaſure to her ſhingle ballaſt being chiefly compoſed of ſand, intermixed with a large portion of wet earth, that keeps up a conſtant moiſture and dampneſs below, in ſpite of every means of ventilation: add to this the putrid ſtench, ariſing in ſo cloſe and crouded a ſituation from the *ſhubs* or ſheep-ſkin great-coats, which are generally wore by the Ruſſian ſeamen, with the woolly ſide next their body, and which undoubtedly muſt aid to nouriſh the ſeeds of contagion, and increaſe its virulence.

I repreſented to ſeveral of the Commanders of the Ruſſian men of war, the neceſſity there was of deſtroying, or at leaſt of ſuppreſſing theſe *ſhubs* in this country, for though they might be very comfortable, and anſwer pretty well in dry, cold, froſty weather, ſuch as is generally the caſe in long winters in Ruſſia, yet they were by no means calculated for the chilly wet weather which generally prevailed in this country; as in a damp ſtate they never fail to impregnate the air with offenſive putrid effluvia, that muſt be extremely hurtful to peoples' conſtitution where it is conſtantly breathed by ſo many crowded together in ſuch a confined ſituation.

Early on the morning of the ninth, the Pamet Euſtaphia, with the Ratvezan of 66 guns, were removed up to Chatham, in conſequence of which it was not in my power to continue the fumigation, though I went there on purpoſe. And on the following day, the crew was ſo buſily occupied, in unrigging the ſhip, and clearing her of ſtores and proviſion, to prepare her for going into dock, that no time could be ſpared to attend to the fumigation, until that duty was accompliſhed; which as it would take up ſome days, and as her people were then to be put on board a receiving ſhip, while ſhe was in dock, (a circumſtance I conſidered as very unfavourable to the experiment) I therefore came to London on the eleventh, to conſult with Doctor Carmichael Smyth, what plan was beſt to purſue; for as this was the only Ruſſian veſſel from which a fair eſtimate could be drawn of the utility and efficacy of the fumigation, I was anxious to continue it, in whatever manner might be thought moſt likely to ſecure ſucceſs in deſtroying the contagion, or leſſening its malignity.

I returned to Chatham again on the fourteenth, with orders to fumigate as many of the

the Ruſſian veſſels, eſpecially ſuch as were moſt ſickly, as I poſſibly could; for though the experiment could not be regularly carried on, yet in this manner it might leſſen the virulence of the diſorder, and diminiſh the number of ſick ſent to the hoſpital.

Next day I waited on Captain Chechagoff and Capt. Sinavin, and found that their veſſels were not yet cleared of their ſtores, &c. ſo that I could not go on with either. Indeed, the Ratvezan was pretty healthy, her Commander, Capt. Chechagoff, being very attentive to every means of purifying his veſſel by ventilation and cleanlineſs, and by deſtroying and ſuppreſſing the *ſhubs*, as far as he poſſibly could; for he told me, he could not do them away altogether, without giving the men other cloathing *in lieu*, which muſt be done by an order from the Commander in Chief.

Captain Chechagoff alſo informed me, that the Pimen, of 66 guns, was arrived at Sheerneſs, which had ſome time ago been ſo very ſickly, that boats from other veſſels were forbid coming along-ſide of her, from a dread of the infection; he therefore expreſſed his

desire of having her well fumigated; and I immediately set out to execute his request.

On the sixteenth of December, I fumigated the Pimen for the first time. Her crew, however, was nowise sickly now, although on visiting her between deck, before the fumigation, the stench produced by the *shubs* was very perceptible, and extremely offensive; and it was pleasing to observe the sudden change produced by the powers of the nitrous vapour in destroying it.

When I went on board, on the following day, to continue the fumigation, I found the officers and crew attending Divine Service, and the Priests sprinkling the decks with Holy-water, so I did not intrude; but left orders with their own surgeon, to fumigate the ship in the evening, if he could conveniently, which he did. As this was a holiday amongst them, I also declined calling on board the Revel frigate till the next day, when, after fumigating the Pimen, I went on board the Revel, to request them to prepare for fumigating her. On visiting this vessel between decks, I found the putrid stench from the *shubs* extremely offensive and

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disagreeable from the confined air, and want of ventilation; and I had great difficulty to make myself understood, or give any particular directions for want of an interpreter.

The nineteenth was so boisterous that I could not get on board either vessel, but the Surgeon of the Pimen was so good as to continue the fumigation as usual. Captain Colokolsoff, the Commander of this vessel, was extremely civil, and well disposed to promote my endeavours; and the principal officers were equally polite and ready to see my directions executed on all occasions.

Next day I visited the Pimen, which was now quite free from stench or any offensive smell, in consequence of the fumigation having been regularly continued. I also began to fumigate the Revel frigate, and regularly attended both vessels, for the three following days; after which I left the materials and utensils on board them, with directions to their own Surgeons to continue it in the same way daily.

From what information I could collect, the Revel had not been very sickly, yet the few she had lately sent to the hospital, were malignant fevers, which clearly shewed that

the contagion was lurking on board her, though it did not ſpread with much violence.

Being particularly anxious to reſume the experiment on board the Pamet Euſtaphia, ſhe being the moſt ſickly, and on that account claiming more particular attention, I came up to Chatham on the twenty-fourth, and found ſhe had been juſt hauled into dock, and her crew put on board the Prince Edward receiving ſhip, where they were very much crouded. On the following day I began the fumigation, but as many of the ports and hatchways of the ſhip could not be ſhut cloſe enough to retain the vapour for a ſufficient length of time, a quick and ſtrong fumigation became more eſſentially neceſſary; which, however, I could not get them to execute, not being able to make them underſtand my meaning, for want of a ſufficient knowledge of their language.

The fumigation was, notwithſtanding, continued regularly on board this ſhip for the four following days, although it was not in my power to prevail on them to do it ſufficiently ſtrong, to do juſtice to the trial,—and to inſure that ſucceſs we had already experienced on board the Union; their excuſe

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generally was, that the fire was too much occupied to get a ſufficient quantity of ſand heated.

But, as it was poſſible, that even this ſlight fumigation might ſucceed by long continuance, and as their own Surgeon was now acquainted with the proceſs, and well diſpoſed to carry it on, I left the materials and utenſils on board; and, before my departure, waited on Captain Sinavin, who, at this time, lived on ſhore, and who (after being acquainted with the foregoing circumſtances) ſaid that he ſhould order it to be continued while his ſhip's company were anywiſe ſickly.

The Ratvezan having likewiſe gone into dock; to prevent her crew becoming ſickly on board the receiving ſhip, I, at Captain Chechagoff's particular requeſt, ſent utenſils and materials on board to fumigate daily.

Having now put theſe Ruſſian veſſels in a fair train for continuing the fumigation; and finding that my preſence, on account of my ignorance of their language, could not be of any further ſervice; at the ſame time, ſome urgent buſineſs, of our late voyage, preſſing hard upon me, I returned to town on

the

the thirtieth of December, leaving the further profecution of the experiment, as above related, to be conducted by their own Surgeons; and I have the moſt pleaſing hopes that it will be attended with beneficial effects to her Imperial Majeſty's ſubjects, not only in the preſent inſtance, but in every ſimilar ſituation hereafter.

ARCHIBALD MENZIES.

Having now, my Lord, finiſhed with the account of the experiment given by the two gentlemen who have been employed in conducting it, permit me, before concluding the ſubject, to call for a moment your Lordſhip's attention to ſome of the principal circumſtances, and to the concluſions which they afford.

In the firſt place, my Lord, it muſt be allowed that the preſent experiment fully juſtifies all I have ſaid reſpecting the ſafety with which the nitrous acid (procured in the

manner

manner deſcribed) may be employed as a fumigation. No one ſurely can ſay that I aſſume too much, when I conſider the ſafety of the fumigation as eſtabliſhed, after a trial of nearly three months, for an hour and a half or two hours, morning and evening, each day, on board an hoſpital ſhip, containing from two to three hundred perſons of different ſexes, and ages, and labouring under different diſeaſes; without a ſingle inſtance of permanent inconvenience or bad conſequence ariſing from it: for the ſlight cough, which it at firſt excited, and which was evidently owing to the aukwardneſs and ignorance of thoſe who carried the fumigating pipkins, cannot be looked upon as ſuch, and no farther inconvenience has ever been felt by any one on board.

Having eſtabliſhed then this important fact, that the nitrous acid is attended with no riſk to the health or ſafety of the people expoſed to it, let me next claim your Lordſhip's attention to the ſenſible and immediate effects of it.

We are told by Mr. Menzies, that after the firſt fumigation, and ſtill more remarkably

bly after the ſecond, the air of the hoſpital was perceived to be purer, and free from any putrid or offenſive ſmell: theſe immediate effects of the fumigation, are likewiſe repeatedly mentioned by Mr. Baſſan, the laſt of them indeed was too ſtriking not to be taken notice of by every perſon on board. That the vapour of the nitrous acid ſhould be found to deſtroy an offenſive ſmell, the effect of animal exhalations, I was not ſurpriſed at, having myſelf had repeated experience of the fact; but that it would alſo render the air purer and more proper for reſpiration, I was by no means certain, until I found the repeated obſervations of thoſe Gentlemen, confirmed by the evidence of Mr. Keir, of Birmingham, one of the firſt chemiſts in this country, or perhaps in Europe; an extract of a letter from this gentleman, whom I have not the honor to know perſonally, to a friend of his in town, I have ſubjoined for your Lordſhip's ſatisfaction, as it affords a convincing proof, from chemiſtry, of the truth of what Mr. Menzies and Mr. Baſſan obſerved in practice. Theſe two qualities, my Lord, viz. the rendering the atmoſpheric air purer, and conſequently

ſequently fitter for the purpoſes of animal life, and the compleatly deſtroying the offenſive ſmell reſulting from animal effluvia or putrid matter, are, of themſelves, conſiderable advantages, if no others were to be expected or derived from the fumigation; but they are of ſtill higher importance, when conſidered as preſumptive evidence of the power of the nitrous vapour to deſtroy contagion; for whatever is found to deſtroy the ſmell of putridity, and at the ſame time to render the air purer, we muſt ſuppoſe more or leſs conducive to this grand object. But preſumptive evidence, on a ſubject of this importance, in which the lives of thouſands are involved, is not ſufficient to ſatisfy the mind; and, happily for mankind, the preſent experiment, inſtituted under your Lordſhip's auſpices, affords compleat and direct evidence of the fact.

But to bring this home to the underſtanding and conviction of all mankind, it is only neceſſary to look with attention, at the annexed Hoſpital Return; for by comparing the ſtate of health of the ſhip's company, with the progreſs and effects of the contagion,

before

before and after the experiment was begun, a clear and decided judgment may be formed of its effects, even by the moſt ignorant. They will in the firſt place obſerve, that from the 3d of September (the day the Ruſſians, ill of the fever, were firſt brought on board) to the firſt of October, there were nine perſons ſeized with the diſtemper, one of whom only belonged to the ſhip's company; the others were attendants on the ſick. That in the month of October, eight perſons more were attacked with the diſeaſe, and of thoſe three belonged to the ſhip's company. But, that from the firſt of November, to the 26th of that month, twelve perſons were attacked with the diſeaſe, among whom we find eight belonging to the ſhip's company. From this ſhort ſtatement it is evident, that the contagion which was at firſt chiefly confined to the hoſpital, affecting thoſe only who were immediately employed about the ſick, had gradually ſpread over the ſhip, and been communicated to the ſhip's company; by which means the ſickneſs and mortality had encreaſed: and the probability is, that had not a ſtop been put to it, it would have gone

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on encreaſing in proportion to the diffuſion of the contagion, and to the encreaſing deſpondency of the people, who conſidered themſelves as ſo many devoted victims. The whole number of perſons ſeized with the diſtemper, during the firſt three months that it prevailed on board the ſhip, was thirty (beſides ſix children) which was more than one-third of all the people in the ſhip, who were only eighty-five, officers included. Of the thirty ſeized with the fever, eight died of the immediate effects of it, a large proportion ſurely, being not much leſs than one in three, and which ſufficiently marks the malignity of the diſtemper.

Having taken a view of the ſtate of the ſhip's company, and of the progreſs of the contagion before the experiment, let us now, my Lord, turn to the other ſide of the picture, and ſee what was the ſituation of things after the fumigation was begun.

On the 26th of November, the ſhip was fumigated for the firſt time, and from that day to the 25th of December, not a perſon on board was attacked with the fever, their deſpondency was now changed into joy, and their fear into confidence; but as very great

confidence is always dangerous, it proved ſo in the preſent inſtance. On the 17th of December, they imagined themſelves ſo ſecure, that they diſcontinued the cuſtom of fumigating the ſhip morning and evening, thinking that once a day was ſufficient; the trial, perhaps, was worth hazarding, but on the 25th of December, one of the nurſes ſuffered a ſlight attack, and on the 26th, a marine, who for a week preceding had been in a ſtate of intoxication, was ſeized with the fever, of which he died. Theſe two accidents gave immediate alarm; they returned again to the practice of fumigating twice a day, and from that time to the end of the diſorder, there has not been an inſtance of a perſon ſuffering from contagion on board the ſhip. But the advantage of the fumigation was not felt by the ſhip's company and attendants alone, whom it preſerved from the baneful effects of the fever, the ſick and convaleſcents derived almoſt an equal benefit from it. The ſymptoms of the diſeaſe (as Mr. Baſſan expreſſes it) were meliorated, and loſt much of their malignant appearance, and the advantage of a pure air, and free from ſtench, to convaleſcents, may readily be conceived.

From the above relation, my Lord, it plainly appears, that whilſt the practice of fumigating the ſhip twice in the twenty-four hours was continued, there was no ſymptom of contagion or of diſeaſe, and that the only two accidents which happened from the commencement of the experiment, to the preſent hour, occurred on the 25th and 26th of December, nine or ten days after they had ceaſed to fumigate the ſhip, in the manner I had directed. The attack of the nurſe, indeed, was but trifling, and I think it not improbable that the fever, as well as the death of the marine, were the conſequence of his own intemperance; at any rate, ſuppoſing both the one and the other to have ſuffered from contagion, theſe caſes do not in the leaſt invalidate the general ſucceſs of the experiment, and only prove, that in a ſituation where contagion is conſtantly generated, it requires to be as conſtantly deſtroyed; otherwiſe it is ready at every inſtant, like the hydra, to rear again its peſtilential head.

But, my Lord, the ſucceſs of the experiment has not been confined to the Union, the power of the nitrous vapour to deſtroy contagion, has been equally diſplayed on board

thoſe Ruſſian veſſels where it has been employed.

Your Lordſhip muſt have obſerved, in Mr. Menzies's Journal, the many unexpected delays he met with in the execution of this buſineſs. The ſudden departure of the Ruſſian Admiral, with a conſiderable part of the fleet, before the ſhips, the moſt proper for the experiment, were fixed upon; Mr. Menzies beginning, in conſequence of not being properly informed, with ſhips where the fumigation was not ſo immediately neceſſary; afterwards, when he began to fumigate the Pamet Euſtaphia, which had ſent more ſick to the hoſpital than any ſhip of the fleet, ſhe was immediately ordered into dock, and the crew turned over into a receiving ſhip, a ſituation extremely diſadvantageous for ſuch an experiment: not to mention the various difficulties and obſtacles ariſing from the difference of language, uſages, religious ceremonies, &c. ſufficient to have diſcouraged a man of a leſs firm mind, or who was leſs zealous than Mr. Menzies in purſuing his object. He perſevered, however, for ſome time, but at laſt was under the neceſſity of returning to town, and of leaving the farther proſecution

of

of this buſineſs to the Ruſſians themſelves; and yet, my Lord, owing to the good ſenſe and proper conduct of their officers, who, convinced of the advantage of the fumigation, continued the daily practice of it; thoſe ſhips that have been fumigated, are free from contagion, and particularly the Pamet Euſtaphia which was the moſt ſickly, is now one of the healthieſt of the fleet, and has no appearance of contagion on board, nor a man ill of the fever; and ſo great is the opinion entertained by Admiral Hannicoff, of the efficacy of the fumigation, that he lately ſent to town for materials for fumigating ſome more ſhips.

Such, my Lord, has been the reſult of an experiment, by which ſome lives have been already ſaved, and from which two important facts are clearly eſtabliſhed, viz. the power of the nitrous acid to deſtroy contagion; and the ſafety with which it may be employed in any ſituation, without inconvenience or riſk of fire.

It would be, perhaps, improper in me to detain your Lordſhip any longer on this ſubject, by endeavouring to point out the importance and extenſive application of the pre-

ſent diſcovery; a diſcovery equally applicable to every ſpecies of putrid contagion, even to the plague itſelf; a diſcovery, therefore, in which all nations are more or leſs intereſted, but whoſe utility muſt be moſt ſenſibly felt by our own; where a commerce, extended to every quarter of the globe, covers the ſea with our ſhips, whilſt our gallant navy ſtill maintains the decided empire of it.

Oh fortunatos nimium, ſua ſi bona norint,
Britannos!

I have the honor to be,
My Lord,
With the higheſt reſpect,
Your Lordſhip's
Moſt obedient and obliged
Humble Servant,
James Carmichael Smyth.

Charlotte-ſtreet,
Bloomſbury,
Mar. 12, 1796.

Earl Spencer.

A RE-

A RETURN of thoſe perſons, amongſt the attendants on the Hoſpital or belonging to the Ship's Company of the Union, who were attacked with the Contagious Fever, from the 3d of September, 1795, when the Ruſſian ſick were firſt brought on board, to the 10th of February, 1796; the date of the laſt report.

(Signed) A. BASSAN, Surgeon of the Ship.

Before the Ship was fumigated.

Names	Quality	When ſeized	Recovered	Dead
S. Brown	Nurſe	Sept. 6	———	
H. Warren	——-	—— 7	———	
M. Mitchel	——-	—— 9	———	
M. Reed	——-	—— 11	———	
Mr. J. Gardner*	Sᵉ 1ſt Mate	—— 15		Sep. 24
M. Rawlins	Nurſe	—— 18	———	
S. Hayes	——-	—— 20	———	
Tho. Mitchel	Helper	—— 22	———	

* He was diſcharged from the Union, and entered on board the Sandwich, the 12th of September; was taken ill a few days after, and died in about a week.

Names	Quality	When ſeized	Recovered	Dead
A. Clavering	Nurſe	Sept. 24		Sep. 28
Tho. Lee	Marine	—— 29		Oct. 1
M. Sawer	Waſher-wo.	Oct. 6		—— 15
Mr Meſſerſmidt	Ss 1ſt Mate	—— 6	——	
A. Bright	Nurſe	—— 8		—— 11
D. Sawer	Ab.	—— 8	——	
H. Tuberville	Nurſe	—— 14	——	
Mr. Bodker	2d Ss Mate	—— 22	——	
Cha. Walton	Ab.	—— 22	——	
James Potter	Marine	—— 22	——	
C. Taylor	Nurſe	Nov. 2	——	
S. Parker	Waſher-wo.	—— 4	——	
Wm. Craſby	Marine	—— 4	——	
Wm. Welch	——	—— 10	——	
Rd. Welch	Ab.	—— 10	——	
Henry Kelly	—	—— 17	——	
Peter Parker	—	—— 17	——	
Geo. Mantle	Marines	—— 18	——	
Tho. Reed	St Marines	—— 18	——	
Joſ. Copeland	Ab.	—— 20		Dec. 4
Ja. Tuberville	Marine	—— 20		Nov. 24
M. Clay	Waſher-wo.	—— 24		T. uncertain
Before the Experiment.——	Total	30	22	8

After the Ship was fumigated.

Names	Quality	When seized	Recovered	Dead
Marg. Murray	Nurſe	Dec. 25	Recov. in a few days	
James Farmer	Marine	—— 26		Jan. 6
Since the Experiment.——Total		2	1	1

N. B. On the 26th of November, the ſhip was fumigated for the firſt time, and the fumigation repeated twice a day till the 17th of December; from that time to the 26th of December, only once; but from the 26th of December to the 10th of February, twice a day, as at firſt.

A Weekly Return of the Ruſſians received on Board his Majeſty's Hoſpital Ship Union, in the Malignant Fever from the 3d of September, 1795, to the 28th of January, 1796, excluſive of thoſe received in a ſtate of debility after the ſaid Fever, and with other diſeaſes. By A. BASSAN, Surgeon of his Majeſty's Ship Union.

Sept. 1795.	Recei v.	Diſcharged.	Dead.
Sept. 3	37		
—— 10	37	1	
—— 17	4	7	
—— 24	34	7	1
Oct. 1	17	17	5
—— 8	29	15	
—— 15	20	5	2
—— 22	15	14	1
—— 29	18	11	1
Nov. 5	31	9	1
—— 12	21	13	
—— 19	20	44	5
*—— 26	29	39	1
Dec. 3	12	5	1
—— 10	12	16	1
—— 17	35	48	
—— 24	8	25	1
—— 31	40	1	
1796.			
Jan. 7	32	25	3
—— 14	13	7	2
—— 21	20	24	3
—— 28	22	23	6
Total	479	356	34

* This day the Ship was fumigated.

From

From the above return it appears, that the number of perſons ill of the contagious fever, brought on board the Union, the two laſt months, December 1795 and January 1796, were nearly equal to the number received the two preceding months, October and November. It alſo appears that for the firſt month, after the ſhip was fumigated, there were few fever patients who died. The encreaſe in the number of deaths in the following month, may fairly be aſcribed to the return of the fleet.

N. B. The greater part of the Ruſſian ſquadron ſailed on a cruize November 29, and returned into port December 27, two or three ſhips at a time.

APPENDIX.

Extract of a Letter from Mr. Keir, of Birmingham, to a Friend in Town.

January 25, 1796.

I CONSIDER Dr. Carmichael Smyth's diſcovery to be very valuable. The fumes in his proceſs are quite different from the ordinary nitrous vapour in the diſtillation of aqua fortis, or from that which exhales in the ſolution of metals, by nitrous acid; the latter is highly ſuffocating and noxious, and may be called the phlogiſticated nitrous acid vapour. The fumes made in Dr. Smyth's manner (if there is no metal employed in the veſſel, &c.) is highly dephlogiſticated or oxygenated nitrous vapour, and is alſo mixed with a large quantity of pure dephlogiſticated air,

air, which is extricated from the materials, and theſe fumes are not only not ſuffocating, but have a very pleaſant ſmell. If the diſtinction is not made between theſe two kinds of vapour, it is to be feared that ſome perſon, by accident, or in expectation of getting the nitrous vapour more expeditiouſly, may uſe metal veſſels, or diſſolve metals in nitrous acid.

Extract of another Letter from Mr. Keir, dated near Birmingham, March 3, 1796.

The difference between the white nitrous acid, (called, by Dr. Prieſtley, dephlogiſticated acid, and by the French chemiſts, acide nitrique;) and the red acid, called phlogiſticated, or acide nitreux, is well known, and was firſt particularly noticed by Scheele, who ſhews how the one may be ſeparated from the other by diſtillation. There is the ſame difference in the colour of the vapours from theſe two acids; and Dr. C. Smith has himſelf obſerved, that the vapours, in the diſtillation of nitrous acid, were not noxious;

which obſervation he has very happily and uſefully applied. In diſtilling the nitrous acid from very ſmall quantities of nitre and oil of vitriol, in glaſs veſſels, and when the materials are very pure, I have ſeen nothing but the white vapours, ſuch as ariſe in Dr. C. Smyth's proceſs, but Scheele ſays, that at the end of the operation, ſome red vapours, riſe, and it may be the caſe when a very ſtrong heat is applied. But the very noxious red fumes which appear in the uſual proceſs of diſtilling aqua fortis, are occaſioned, as you mention, by the iron veſſels; and the manufacturers even put in old nails and ſmall pieces of iron into their pots, in order to give a high degree of red ſmoking quality to the acid. When you acquainted me of Dr. C. Smyth's diſcovery, it occurred to me, that as the common notion of nitrous acid vapours, is confined to thoſe that are red, ſome people might, in the firſt place, be prejudiced againſt it, from the idea of the vapours being noxious; as the red vapours are undoubtedly, and others might think that they made the proceſs more effectual, by adding to Dr. C. Smyth's mixture, metals, or inflammable ſubſtances, in order to pro-

duce

duce thoſe red vapours. I therefore thought it would be proper for Dr. C. Smyth, to point out the difference between the vapours produced in his method, and the red nitrous fumes which are ſo well known; and alſo to caution the operators to avoid metal veſſels, or the addition of metals or inflammable ſubſtances.

There is a good deal of vital air extricated from the mixture, but I cannot agree with thoſe who attribute the medicinal effect to it, we know little of this ſubject; but the analogy of the deſtruction of all animal and vegetable fermentation by mineral acids, which is well aſcertained, inclines me to believe the agency of the acid, in the deſtruction of the contagion. The matter of which is, I preſume, animal, in ſome vitious kind of fermentation.

A Letter from Mr. Baſſan, Surgeon of his Majeſty's Ship Union, to Dr. Carmichael Smyth, under date, the 16th of February, 1796.

DEAR SIR,

WE had an encreaſed mortality amongſt the Ruſſians laſt month, but, thank God, not from the contagious fever, that being now totally extinct; but from ſome being brought in a dying ſtate, others in the ſcurvy, the moſt deplorable caſes I ever ſaw, added to which, ſeveral hectic patients, who had been declining ſome time, happened to die at that particular period. I hope we ſhall have no return of ſo dreadful a calamity.

I remain,

Sir,

Your moſt obedient Servant, &c.

(Signed) A. BASSAN.

Extract

Extract of a Letter to Mr. Menzies, from Captain Chechagoff, Commanding Officer of the Ruſſian Fleet, in the abſence of his Excellency Admiral Hannicoff. Dated Chatham, March 9, 1796.

AGREEABLY to your wiſh, it is with the utmoſt pleaſure that I expoſe the proofs of a truth ſo uſeful for the human kind, and ſo much to the honor of thoſe that are the primitive cauſe of it, and thoſe that put them in execution, with an efficacy, as is acknowledged in the certificate here joined. I beg to preſent my compliments to Dr. Smyth, for whom I have the reſpect that is owing to all thoſe who have aſſured their renommée *, by the good they have done to the public, and to get its ſuffrage. I am, with much eſteem, &c.

(Signed) P. CHECHAGOFF.

* The public will recollect that Captain Chechagoff is a foreign officer, writing Engliſh, and therefore will not be ſurpriſed at his making uſe of one French expreſſion.

CER-

CERTIFICATE.

" It has been obſerved that the fumiga-
" tion, with the nitrous acid, introduced by
" Mr. Menzies on board the ſhip Pamet
" Euſtaphia, has produced, in a ſhort time,
" the beſt effect in ſtopping the progreſs of
" the fever and other evils, which were then
" evidently increaſing, for which reaſon it
" was not only regularly continued on
" board of that ſhip, even after Mr.
" Menzies's departure, but adopted on
" board of others, and always found uſe-
" ful. It is therefore my duty to cer-
" tify by this not only the good conſe-
" quences that have been obſerved from
" that uſeful contrivance, but even the ad-
" vantage that ariſes from its eaſy and ſure
" execution, in compariſon with other means

" of fumigating the ſhips which requires
" greater attention from the fire that muſt
" be made uſe of, and therefore cannot
" be effectuated in all the parts of the
" ſhip."

(Signed) CHECHAGOFF,

Captain and ſenior Officer of the
Ruſſian Fleet.

March 10, 1796.

COPY

COPY

OF A

LETTER

FROM

DAVID PATERSON, ESQ.

SURGEON IN HIS MAJESTY'S NAVY,

AND LATE

SURGEON TO THE PRISONERS OF WAR AT FORTON;

TO THE

COMMISSIONERS

For taking Care of Sick and Wounded Seamen.

Copy of a Letter, &c.

Gentlemen,

LAST winter, while I had charge of Forton hoſpital, although in the midſt of very fatiguing duty, and engaged, as I was, in making ſome favourite experiments of my own, yet, being extremely anxious to acquire ſome practical knowledge of Doctor J. C. Smyth's nitrous vapour, I failed not, after receiving your authority, to put his fumigating plan in execution, as extenſively as it was poſſible; nor, at the ſame time, to note down the phænomena, as they occured, with as much accuracy as my leiſure time would permit. And now, in order that you may ſee, in the faireſt points of view, ſome of the effects of the vapour reſulting from that highly ingenious, and very ſalutary proceſs; and, alſo, with the view no leſs of doing juſtice to Doctor J. C. Smyth, than of rendering his nitrous vapour more extenſively uſeful, in the Navy, Army, &c. I beg leave to communicate to you the contents of

the following pages; which, ſhould they appear to you in any degree calculated to be ſerviceable, in promoting the welfare of theſe realms, I humbly requeſt you will be pleaſed to lay them before the Right Honorable the Lords Commiſſioners of Admiralty.

In purſuing my preſent plan, I ſhall, after giving you a ſhort, but not imperfect account of the method I followed in fumigating the wards of the hoſpital, ſtate, in a faithful manner, ſuch facts, whether of a general, or of a particular nature, as aroſe from the trials that were made; after which, by moſt humbly offering a few obſervations connected with the ſubject, I ſhall conclude my letter.

Every evening a certain number of wards were fumigated, each by means of three pipkins, for an hour; the gally-pot in each pipkin containing the quantities of pure nitre in powder, and concentrated vitriolic acid as directed by Doctor Smyth *. Three perſons,

* For a more particular hiſtory of the proceſs Vide, Doctor J. C. Smyth's letter to the Right Hon. Earl Spencer, &c. &c. &c. containing an account of the experiment made on board the Union hoſpital ſhip, to determine the effect of the nitrous acid in deſtroying contagion, &c.

each

each carrying one fuming pipkin, went round a ward, following one another at ſome diſtance, and holding the pipkins under each bed, for a conſiderable time, as they went along; and they continued doing ſo as long as the fumigation laſted. The wards, by opening the windows and doors, were afterwards filled with atmoſpheric air.

The vapour, proceeding from the decompoſition of the nitre, by means of the concentrated vitriolic acid, was in ſuch great quantity, that a ward 57 feet by 20, and 10 feet 6 inches high, was filled with it, by means of three pipkins, in the manner I have mentioned, in the ſpace of fifteen minutes.

On the wards being filled with nitrous vapour, ſome of the patients who laboured under affections of the lungs were ſeized with fits of coughing; none of them, however, to any great degree. With little or no exception, the patients, in the wards that were fumigated, bore the vapour without feeling any diſagreeable effect from it. If, indeed, a pipkin was, accidentally, held very cloſe to the mouths of any of the patients, which, from awkwardneſs, was ſometimes the caſe,

coughing was immediately produced; and, in one inſtance, vomiting was occaſioned. Theſe circumſtances, however, did not prevent the patients from becoming, in a ſhort time, very fond of the fumigating buſineſs. For my part, I frequently remained in a ward during the whole time of the fumigation, often indeed with a fuming pipkin in my hand, without experiencing any diſagreeable effect whatever. The fume was to me pleaſant. When, during the fumigation, I remained in a ward, I always wore black clothes, which, even, after being repeatedly expoſed to the nitrous vapour, were not in the leaſt either ſtained, or changed from black to a brown colour.

In the mornings, particularly in dry weather, the wards that had been fumigated the preceding evening, even although they had been waſhed early in the morning, and the windows kept open, had a very agreeable ſmell, much more pleaſant than that which was experienced during the fumigation. By this agreeable odour, in the mornings, I was able to judge whether or not due pains had been beſtowed, the preceding evening, in fumigating the wards.

One

One dyſentery ward, one fever ward, and one ſurgery ward, containing the worſt kind of Ulcers, were, at firſt, the places filled every evening with the nitrous vapour; but, as the good effects reſulting from the fumigation were to me very obvious, I ſoon uſed it more extenſively. The patients, in general, who laboured under old dyſenteries, many of them contracted in the Weſt Indies, ſeemed to be greatly relieved *; the fevers, which were of no uncommon genus, and which were in their nature very mild, ſoon diſappeared, without exhibiting any ſymptoms of typhus; and the ulcers, inſtead of further degenerating or ſpreading, put on a favourable appearance, and healed.

It is, I preſume, of no ſmall conſequence to obſerve, that, excepting ſome marked caſes of dyſentery, among the ſervants of the priſon and hoſpital, in the months of Auguſt and September, before the arrival of the priſoners from the Weſt Indies, and one caſe of typhus (in ward 18) with now and then a caſe of ſmall-pox, among the Weſt Indians,

* Ultimately, a great number of the old dyſenteries, where the patients were not far advanced in life, did well.

after

after their arrival, there was not any contagious febrile diſorder that made its appearance within the walls of the hoſpital, while I had charge of it, notwithſtanding the many ſources of contagion to which, in my opinion, all in and about it were expoſed. During the laſt five months of my time, no fewer than 1686 patients were admitted into the hoſpital, as may be ſeen by the hoſpital books.

The following table ſerves to ſhew, at one view, the higheſt number of patients in the hoſpital, the number diſcharged and dead, weekly, for four weeks before, and ſix weeks after the nitrous vapour was firſt uſed; viz. from the 16th of October, to the 26th of December, 1796. To include a greater ſpace of time would be improper; becauſe, before the 16th of October, there were but few patients in the hoſpital; and, becauſe, after the 26th of December, there were a great number of extremely bad caſes of gangrenous feet, pneumonia, &c. received into it, from Portcheſter hoſpital, and from the Vigilant and Captivity priſon ſhips.

TABLE.

TABLE.

Before the Nitrous Vapour was uſed				After the Nitrous Vapour was uſed.			
Weeks	Higheſt Number in the Hoſpital	Number diſcharged	Number dead	Weeks	Higheſt Number in the Hoſpital	Number diſcharged	Number dead
1	223	2	8	1	340	27	6
2	372	4	21	2	332	7	5
3	371	0	13	3	342	11	8
4	369	1	9	4	340	8	4
				5	486	12	1
				6	539	63	5
		7	51			128	29

After theſe general obſervations on the nitrous vapour, I ſhall humbly beg leave to offer the following Caſes, in which it was, undoubtedly, uſed with very remarkable ſucceſs.

CASE I.—Jean Louis, French priſoner, of colour, eighteen years of age, from the Weſt Indies, was admitted into the hoſpital on the 28th of October 1796, for an ill-conditioned Ulcer on the inferior and interior part of the right leg. After he had been

ſome

time in the hoſpital, the ulcer began to put on a favourable appearance, and was ſoon conſiderably diminiſhed in its ſize, merely by means of ſimple dreſſings.

On the 29th of November, however, the ulcer according to the common phraſe, became foul; and, by next day, it had ſpread to ſuch a degree, that it was nearly as extenſive again as it ever had been, attended with very acute pain, and with a very copious thin dark-coloured fetid diſcharge. The patient's pulſe, at this time, was 120, tongue clean; appetite impaired, belly open; ſleep much diſturbed.

31ſt. From the 29th to this time, a common poultice, thrice a day, was the only application; but now, in addition to the poultice, the ulcer was dreſſed with the powder of Peruvian bark; a cooling medicine, with an opiate at bed-time, was ordered; and a vegetable diet with milk was enjoined.

2d December. The ulcer ſtill more extenſive than it was on the 31ſt ult. It now extended from the Tarſus ſix or ſeven inches upwards, and from the Tibia more than half round the leg: it was ſtill in a ſloughing

ſtate, with high, reflected edges. The other ſymptoms much the ſame as before. Finding that the plan hitherto purſued had not produced any good effect, either on the ulcer or on the ſyſtem, the whole of it, excepting the poultice, was abandoned, and the nitrous vapour adopted. The ward in general, and the bed of the patient in particular, were carefully fumigated, the ward once, the bed twice a day.

3d. The ulcer had ſtopt ſpreading, and in ſome places looked clean. Such a ſudden change was to me aſtoniſhing. Pulſe now 110; tongue clean; belly open; ſlept better on the night of the 2d than for ſome time before, notwithſtanding the omiſſion of the opiate.

4th. The ulcer was clean, and diſcharged good matter. The patient felt himſelf comfortable. Pulſe about 90.

6th. The diſcharge continued to be good; and the ulcer had made conſiderable progreſs in healing. The patient felt himſelf perfectly eaſy, and his health was already very much mended.

The fumigation was continued until the 26th of December; from which time, owing

to

to a want of materials, it was discontinued until the 11th of January, 1797. The ulcer, during the time the fumigation was used, and even to the 1st of January, 1797, continued to heal kindly, and rapidly; but, at that period, it again became foul and sloughing, and was soon as extensive as before. The appetite was again impaired; pulse 120, and small; belly open; the patient much weakened and emaciated. Half a drachm of Peruvian bark, thrice a day, and eight ounces of wine in the twenty-four hours, were ordered; and the ulcer was dressed twice a day with the powder of Peruvian bark and common poultice. An opiate was occasionally allowed at bed-time. This treatment was preserved until the 11th, when, having experienced no good effects from it, it was discontinued, and recourse again had to the nitrous vapour, and common poultice, as on the 2d of December, 1796.

12th. The ulcer had stopt spreading, and in some places had begun to clean. The pulse was less frequent, and more full; and the patient was, in every respect, better, and more comfortable. The nitrous vapour, &c. were continued.

13th

13th. The ulcer was perfectly clean, with florid granulations, and with about the eighth of an inch of new skin round the edges. The plan was continued.

20th. The ulcer looked very healthy, and was contracting rapidly. The plan was continued.

5th February. The ulcer had contracted more than one half. The plan was continued.

12th March. The ulcer was nearly healed, (not so much as the breadth of a sixpence being open) and looking healthy. On this day I finished my duty, and, consequently, my observations, at Forton hospital.

I have here to observe, that about the 1st of January 1797, all the ulcers in the same ward (N° 14) with the above, were more or less in a bad state; and that they all, about one and the same time, began to put on a favourable appearance; and also that, in a short while, many of them healed. Likewise, it is necessary to observe, that particular attention was paid all along to cleanliness and ventilation.

CASE II. La Granade, French prisoner, aged 26 years, from the West Indies, was admitted

admitted into the hoſpital on the 16th of December, 1796, for chilblains. In the end of February 1797, an ulcer broke out on his left leg, which became very foul and ſloughing, and did not yield to common remedies. On the 7th of the following March, the nitrous vapour was uſed, exactly in the ſame manner as in the preceding Caſe, and by the 12th the ulcer was perfectly clean.

CASE III.—Elie Double, French priſoner, aged 22 years, from the Weſt Indies, was admitted into the hoſpital on the 28th of October 1796, for an ulcer on the anterior and middle part of his left leg. By the middle of February, 1797, the ulcer was cicatriſed, but with a conſiderable protuberance remaining over that part of the tibia, as if the perioſteum and even the bone itſelf, had been in a diſeaſed ſtate. About the end of February the cicatrix bacame inflamed ſoon ſuppurated, and degenerated into a foul ſloughing ulcer, which, inſtead of yielding to any of the various applications, got worſe and worſe every day. From the end of February, (I cannot exactly tell the day,) cataplaſms of different kinds, myrrh, and Peruvian bark, were tried externally; and wine,

Peruvian

Peruvian bark, opium, &c. were adminiſtered internally. At the ſame time, great attention was beſtowed in keeping the ward extremely clean, and thoroughly ventilated. Finding not only that no good effect was produced by any of theſe means, but even that the ulcer, the ſound parts being ſtill in a mouldering ſtate, grew more and more extenſive, I came to a determination, conſidering myſelf ſufficiently authoriſed, from the experience I had had, to make trial, in this untoward caſe, of Dr. J. C. Smyth's nitrous vapour. Accordingly, on the 7th of March the fumigation was put in practice, in the ſame way as in the foregoing caſes; and, it is with heart-felt pleaſure I relate it, by the 12th, that was in five days time, and on the day I finiſhed my duty at Forton, the ulcer was perfectly clean and healthy.

CASE IV.—Francois a negro French priſoner, age unknown, was admitted into the hoſpital on the 26th of January 1707, for a wounded little finger. On examining the wound, I found that the laſt bone and the ſurrounding liguments were the parts moſt materially injured. The bone was fractured, and the ſoft parts were contuſed to a very

great degree, with a ſmall lacerated wound at the tip of the finger. Deeming it neceſſary, I immediately amputated the limb at the joint formed by the ſecond and laſt phalanges. The ſtump, the bone being well covered, and the ſoft parts looking healthy, had all the appearance of doing well, during the firſt fortnight; but, unfortunately, at the expiration of that period, it began to put on a very unfavourable aſpect. Inſtead of the diſeaſed parts being ſinuous, or having, what is perfectly underſtood in ſurgical language, a glaſſy appearance, which ſometimes indicate a diſeaſed bone, they became enlarged to a prodigious degree, reflecting very conſiderably, ſo as to reſemble a ball on the end of the ſtump; and, at the ſame time, appeared foul, diſcharging a dark thin fetid matter. In this ſtate, Peruvian bark, opium, &c. were tried, as alſo cataplaſms, but to no purpoſe. In the end of February, recourſe was had to the nitrous vapour; and, by means of it, in ſix days time, the ulcer was perfectly clean.

CASE V.—Baſtern, a negro French priſoner, age unknown, was admitted into the hoſpital on the 28th of January 1797, for an ulcerated

ulcerated toe. This caſe very ſimilar to the finger of which I have juſt taken notice, and, like it, after various ineffectual applications, was cleaned, and put, ſeemingly, in a healthy ſtate, by means of the nitrous vapour uſed according the manner I have already related. The four laſt caſes were in the ſame ward, No. 4.

Having, with reſpect to Dr. J. Smyth's nitrous vapour, agreeably to my promiſe, finiſhed the moſt important part of my experiments, with the phænomena reſulting from them, in order to ſhew you that vapour, under proper management, is capable of producing very happy effects on the human frame, I ſhall now moſt humbly offer a few obſervations which appear to me to be connected with the ſubject.

And, to proceed; I am in great hopes that the facts detailed in theſe pages, while they ſerve as ſo many proofs of the utility of Dr. J. C. Smyth's fumigating plan, will, at the ſame time, anſwer the happy purpoſe of not only removing the ill-grounded fear of Dr. Trotter, and of convincing him, as well as thoſe who think as he does, that no danger is to be apprehended from the combination

of azote with the nitrous vapour; but, alſo, of conquering the prejudices of thoſe gentlemen who imagine (for ſome highly reſpectable medical practitioners have lately mentioned to me their apprehenſions) that that vapor, from its being loaded with vitriolic acid, muſt be intolerable to the lungs, and of courſe highly pernicious to perſons ſubjected to its influence.

With regard to the bad, or deleterious effects of the nitrous vapour, I cannot ſay, from experience, that I am acquainted with any of them. The trials that I made of that vapour were on a great number of diſeaſed perſons, who, although crowded together within the walls of an extenſive hoſpital, and from that circumſtance, as well as others of at leaſt equal moment, expoſed to the influence of noxious effluvia, were obviouſly, in many inſtances, as already mentioned, benefited by its ſalutary effects. Many patients were cured; others were put in the fair way of being cured. And, I muſt add, for it is not, I preſume, altogether improbable, that, by means of the nitrous vapur, with other no leſs important meaſures, which I adopted, and inceſſantly followed when in my power,

the

the patients who were under my charge, in Forton hoſpital, were preſerved from the attacts of contagious fever. I have ventured to ſay with other no leſs important meaſures, becauſe I am well aware, as Dr. J. C. Smyth undoubtedly is, that, without the moſt ſtrict attention to cleanlineſs, and to the circulation of pure or atmoſpheric air, neither the nitrous vapour, nor any thing adminiſtered with ſimilar intentions, can prove ſo efficacious as we could wiſh, in preventing or putting a ſtop to contagious fever, as well as other diſeaſes, though perhaps not ſo immediately, yet ultimately as fatal. I am here under the neceſſity of obſerving, having forgot to do it in the proper place, that the ſolitary caſe of Typhus, which, as before mentioned, was in ward eighteen, did not originate in the hoſpital, but in the Captivity priſon ſhip. What the nature of the diſorder had been primarily, I am at a loſs to ſay. The patient died, and, fortunately, ſo did the diſeaſe; for I ſaw not another fever of a ſimilar nature in the hoſpital.

As no contagious fever (I mean typhus, or what ſome authors have called jail fever, others hoſpital fever, &c.) prevailed, during my

time, in Forton hoſpital, I cannot ſay poſitively that the nitrous vapour ſolely prevented ſuch a fever from prevailing. All that I can ſay is only, that the circumſtance of no contagious fever having prevailed in Forton hoſpital, during my time, may be conſidered as being of a very ſingular nature; more eſpecially when we take into our view the vaſt number of patients, in the moſt filthy ſtate, from the Weſt Indies, &c. that were received. The very particular attention that was paid to the patients, on their being received, in ſtripping them of all their clothes, in bathing them, in ſhaving their heads, in burning all their clothes, and alſo in keeping the hoſpital, at all times, extremely clean, and thoroughly ventilated, may, it is probable, have contributed not a little towards preventing contagious fever. And, further, another circumſtance which, perhaps, had operated very powerfully in aſſiſting to obviate contagious fever, and which deſerves to be very particularly remarked, was the changing of the wards as frequently as it was poſſible, and that according to the nature of the complaints they contained: for inſtance, and by compariſon, wards that contained convaleſcents,

and

and alſo thoſe that contained ſlight or chronic diſeaſes, were changed frequently; thoſe that contained febrile diſeaſes more frequently, and thoſe that contained very bad ſurgical caſes moſt frequently. By the changing of wards, I mean the removing of the patients from one that they had occupied for ſome time, to another that was perfectly purified.

When a ward of whatever deſcription was changed, it was firſt emptied, by the patients being removed into another, and by its bedding being ſent to be baked, fumigated, or waſhed; and then it was without loſs of time fumigated by means of ſulphur; then white-waſhed; then its cradles cleaned, and waſhed with vinegar; then the floor of it thoroughly cleaned; and, laſtly, its windows on the one ſide, and its ſcuttles on the other, were kept open, always when the weather would permit, until it was again occupied by patients, which, if the ſtate of the hoſpital admitted, was not before eight days had expired. Such regulations as the above ought, in my humble opinion, to be conſtantly and very particularly obſerved, by all medical men who have the immediate charge of hoſpitals for priſoners of war: many of them, I preſume, might, with propriety and utility, be obſerved in any hoſpital;

and, in concluding this ſubject, I beg leave humbly to ſuggeſt to you that no hoſpital ought to be full, but, on the contrary, that there ſhould always be, in all, according to their different ſizes, two, three, four, or more wards left empty, for the very ſalutary purpoſe of changing.

Cleanlineſs, ventilation, and changing of the wards, whether with the view of obviating or removing diſeaſes, are, in all hoſpitals, as well as in all places where priſoners of war are confined, &c. abſolutely neceſſary: where they are obſerved, medicines will become leſs needful; and when needful, they will, in their operation, be more effectual; but, where they are neglected, the phyſicians and ſurgeons will be ſubjected to the very unpleaſant trouble of giving their attendance, and of preſcribing, to very little purpoſe. Warmth ought alſo to be attended to.

In ſuch eſtabliſhments as Forton, cleanlineſs, a free circulation of air, proper diet, &c. ought, agreeably to the very particular orders which you iſſue, to be moſt rigidly attended to, from one end of theſe eſtabliſhments to the other. But, I am afraid, orders are not always rigidly executed. The unpar-

unpardonable neglect of ſervants, in not executing, with promptitude and ſcrupulous punctuality, the orders with which they are entruſted, is to be lamented, but, I fear, not to be, on all occaſions, either prevented or corrected. From what I know of the eſtabliſhments in queſtion, I ſhall venture to ſay, that, were they always to be properly conducted by the ſervants who have the immediate charge of them, we ſhould hear leſs frequently of the priſoners, &c. falling a prey to contagious fever than we have hitherto done. This is a ſubject, however, with which, at preſent, I ſhall not further concern myſelf, excepting to make the following obſervation, which is, that while due care is not taken, in the firſt inſtance, to prevent contagion from taking effect, the uſe of Dr. J. C. Smyth's nitrous vapour becomes, undoubtedly, the more particularly neceſſary: but I am extremely ſorry to think that Dr. Smyth's plan, as well as others equally well intended, ſhould not always be put in execution, but more eſpecially in caſes of emergency, with that facility, with that cagerneſs, with that candour, which duty, juſtice, and humanity, continually require.

Although

Although I have, in the courſe of theſe obſervations, laid very conſiderable ſtreſs on cleanlineſs, ventilation, changing of wards, &c. yet I would not, by any means, wiſh it to be ſuppoſed that I have done it with the view of ſuperſeding the uſe of the nitrous vapor: on the contrary, while on the one hand I am ſenſible that the nitrous vapor cannot, without cleanlineſs, ventilation, changing of the wards, &c. be ſo efficacious as we could wiſh, in putting a ſtop to contagious fever; I am, on the other hand, no leſs ſenſible that that fever, when raging to a violent degree, cannot be exterminated by means of cleanlineſs, ventilation, &c. without the aſſiſtance of ſome other means. With reſpect to hoſpitals, ſhips, priſons, &c. where people are crowded together, where the introduction of contagious fever is dreaded, or where it actually prevails, the nitrous vapour, with due attention to cleanlineſs, ventilation, &c. may, at once, I preſume, not only be conſidered the moſt convenient, the moſt elegant, and the moſt ingenious, but alſo the moſt efficacious remedy for the purpoſe of counteracting different ſpecies of contagion, that has yet been offered to the public.

Further,

Further, although cleanlineſs, ventilation, and the changing of wards, very ſtrictly attended to, might, in a very great meaſure, prevent contagion from taking effect, or from ſpreading extenſively, yet, ſuppoſing them to be attended to as ſtrictly as, from the nature of things, it is poſſible, they could not, I am too much afraid, deſtroy contagion, when prevailing in an extenſive hoſpital, &c. For example, let us ſuppoſe only five or ſix hundred patients confined in Forton hoſpital, and labouring under contagious fever; and let us alſo ſuppoſe it neceſſary, for the ſake of cleanlineſs, and of putting a ſtop to the contagion, to completely ſhift all theſe patients once, perhaps many of them twice, and ſome of them even thrice, every day; how, give me leave to aſk, would it be poſſible to furniſh ſuch a great number of patients ſo frequently with the clean things required? For my part, I am fully perſuaded that it would prove difficult; ſo extremely ſo, indeed, that it would amount even to an impoſſibility. With reſpect to ventilation, has it not been found, even when it has been attended to very particularly, to be, without the aſſiſtance of other means, inadequate to the ſpeedy

deſtruc-

deſtruction of contagion? And, with regard to the changing of wards, were it ſufficient of itſelf to deſtroy contagion, might it not, I ſhall ſay ſometimes, from the number of patients received being equal, nay even more than equal, to all the wards of which the hoſpital conſiſts, be utterly impracticable? Other examples, and other queries, to the ſame effect, were they not deemed ſuperfluous, might be advanced: then, conſidering the buſineſs in this point of view, does it not become a duty incumbent on us to look out for, and to try other means more active, and more diffuſive, which, with the aſſiſtance of cleanlineſs, ventilation, changing of wards, &c. may be employed for the purpoſe of more ſpeedily, and more effectually deſtroying contagion? and may not the nitrous vapour of Dr. J. C. Smyth, as I have already mentioned, be deemed, of all other remedies extant, the moſt convenient, the moſt elegant, the moſt ingenious, and the moſt efficacious for anſwering the wiſhed-for purpoſe, whether at ſea or on ſhore?

The extraordinary effects which we have ſeen the nitrous vapour produce, in caſes of putrid ulcers, are facts of the utmoſt importance to man-

mankind, and certainly deſerve the moſt ſerious attention of medical practitioners. They not only ſhew, in the moſt ſatisfactory manner, the power of that vapour in ſuch caſes, but alſo point out, in my humble opinion, the probability of its having, in a ſimilar way, as ſalutary a power in contagious fever, and in many other diſeaſes proceeding from other ſpecies of contagion. This opinion may, perhaps, ſeem ſingular; but I ſhall endeavour to evince its conſiſtence with reaſon and experience.

In hoſpital practice, it has been frequently obſerved, not only by me, but by other medical practitioners, that all the ulcers of patients in the ſame ward have on a ſudden, and nearly at one and the ſame time, changed from, apparently, an healthy, to a foul, ſloughing, or putred ſtate. I have beſtowed conſiderable attention in obſerving this change; and, in the courſe of my practice, have been able to make the following remarks, which I ſhall here arrange as they ſtand among my memorandums.

That, firſt, one ulcer degenerated, then another, and ſo on, until all the ulcers, in the

the ſame ward had taken on a ſimilar diſpoſition.

That thoſe ulcers neareſt the one which firſt degenerated were ſooner affected than thoſe at a greater diſtance.

That this lamentable change did not happen in all the ſurgical wards at the ſame time.

That the patients, when their ulcers were in this degenerated ſtate, laboured, more or leſs, under ſymptoms of fever, ſuch as a frequent, ſmall pulſe, unnatural heat, ſometimes chillineſs, dry ſkin, loſs of appetite, &c.

That common dreſſings, common poultices, carrot poultices, turnip poultices, myrrh, Peruvian bark, applied to the ulcers, had no good effects.

That Peruvian bark, wine, opium, given internally, had, I thought, inſtead of good, bad effects.

That, in one caſe, yeaſt was tried, both internally and externally, but the diſeaſe evidently gained ground under the courſe.

That the acetum nitroſum *, whether uſed

* Vide Paterſon on Scurvy.

internally

internally or externally, ſeemed to have good effects.

That the changing of the wards had always good effects.

That the nitrous vapour, with the like attention to cleanlineſs and ventilation as was in common beſtowed, had, without changing the ward, as in the five caſes mentioned, as well as in many others, effects ſuperior to thoſe reſulting from the changing of the ward, without the uſe of the nitrous vapour.

That the nitrous vapour had not the like good effects, without cleanlineſs and ventilation, as with them.

From theſe premiſes, I have thought it warrantable to draw the two following concluſions:

1. That ſuch a degeneration of ulcers, in hoſpitals, from, apparently, an healthy, to a foul, ſloughing, putrid ſtate, can only be accounted for on the principle of contagion.

2. That the nitrous vapour, with due attention to cleanlineſs, ventilation, changing of the wards, &c. is, ſeemingly, the remedy, of all others extant, beſt calculated for preventing,

venting, or ſpeedily deſtroying that contagion; and from this naturally ariſes the following query:

As, under ſuch regulations, the nitrous vapour has ſuch great power in preventing or deſtroying one ſpecies of contagion, may it not, under the ſame regulations, be equally powerful in preventing or deſtroying other ſpecies of contagion?

I muſt here obſerve, that the ſecond concluſion does not exclude the uſe of other medicines. Suitable remedies, both internally and externally, uſed at the ſame time with the nitrous vapour, will, no doubt, forward the cure. But, as theſe pages are intended for the purpoſe of pointing out ſome of the effects of Dr. J. C. Smyth's nitrous vapour, and not as a treatiſe on ulcers, I cannot, with reſpect to the latter, make, with any degree of propriety, an attempt on either the indications of cure or remedies.

On the preſent ſubject, I might, to what has beeen advanced, add many more medical obſervations, were I not of opinion that, after the experiments of Dr. Smyth *, they

* Vide Dr. J. C. Smyth's letter to the Right Honourable Earl Spencer, &c. &c. &c.

would appear ſuperfluous; and I might, with equal propriety, have recourſe to chemical reaſoning, were I not prepoſſeſſed with the idea that, conſidering what has been already ſaid, reſpecting Dr. Smyth's nitrous vapour, by that very ingenious chemiſt Mr. Keir, of Birmingham *, it would be extremely preſumptuous.

On the whole, and to conclude, I cannot help being of opinion, as well from the facts with which Dr. Smyth has favoured the public, and from what Mr. Keir has advanced, as from my own experience, that very great benefit muſt reſult to mankind from the *proper uſe* of the nitrous vapour, on board of ſhips, in hoſpitals, in priſons, in all places where people may be crowded together, and even in private families, in preventing and in putting a ſtop to contagion, as well as in mitigating and removing other diſeaſes, in which other medicines would not perhaps have the like good effects. And, therefore, I moſt ſincerely wiſh that the plan of Dr. J. C. Smyth may be uni-

* Vide Dr. J. C. Smyth's letter to the Right Honourable Earl Spencer, &c. &c. &c. Appendix.

verſally adopted; and that it may, for the good of our navy and army, for the honour of our country, and for the benefit of mankind, be practiſed by medical men, and others, without their conceiving any prejudice againſt either it or its ingenious Author.

I have the honour to be,
Gentlemen,
Your moſt obedient,
Very humble Servant,

Montroſe,
12th *Auguſt*, 1797. David Paterſon.

POSTSCRIPT.

SINCE finiſhing the preceding letter, I have had an opportunity of making further trial of the nitrous vapour, in a diſeaſe of a ſingular nature. The hooping cough, which has been prevailing here all this ſummer, made its appearance in my family laſt month, this being a contagious diſeaſe, and a change

of air having been found uſeful in removing it, I ſuppoſed that the nitrous vapour might not only operate in counteracting the contagion, but alſo have effects ſimilar to the changing of ſituation; and hence, that it might, providing the lungs of my little patients could bear it, prove a convenient, an elegant, and uſeful remedy, on the preſent occaſion. It was from theſe conjectures, and knowing that it would have been extremely inconvenient for me to have ſent my children from home, that I ventured to make trial of Dr. Smyth's fumigating plan; the reſult of which I ſhall ſtate, as briefly as poſſibly, by ſketching the following caſes.

My third child, a girl of five years old, was ſeized with a ſlight inflammation of the throat, attended with hoarſeneſs, about the 6th of laſt month; and about the 10th with a cough, on which the inflammation and hoarſeneſs went off, the cough for ſome days, ſeemed to be of a common kind, from cold; but by the 15th it aſſumed the appearance of hooping cough, accompanied with a ſlight degree of fever. By this time my ſecond child, a girl of ſix years, and alſo,

my fourth or youngeſt, a boy of fifteen months, had begun to cough *.

On the 17th, the third child had frequent and violent fits of coughing, with the hoop ſtrongly marked; and the ſecond and fourth, though not ſo ill, evidently laboured under the diſeaſe. In the evening of this day, I began the uſe of the nitrous vapour, I ſhut up my little patients, with a ſervant, in their bed-room ſixteen feet by twelve, and ſix feet nine inches high, myſelf ſuperintending the buſineſs. Inſtead of a pipkin for holding the hot ſand, I uſed an iron pot, in which was placed two gallipots, containing the concentrated vitriolic acid and nitre, according to the directions of Dr. Smyth, In about five or ſix minutes the room was filled with vapour, and continued ſo for an hour, without any of the children coughing or ſhewing any ſigns of uneaſineſs.

18th, 19th, 20th. The fumigation was repeated every evening, and continued an hour, without coughing or any uneaſineſs occurring.

* My oldeſt child had the hooping cough about three years ago.

21ſt.

21ſt. Now, all my little patients ſeemed better, the fits of coughing recurring leſs frequently, and the mucus being more eaſily diſcharged than before.

14th September. From the 20th ult. to this time, the fumigation was repeated only ſix times, exactly in the ſame manner as before, without the children complaining of, or apparently feeling any diſagreeable effect from it; and now, on account of the mildneſs of the diſeaſe, the cough not being troubleſome even in the night, it was diſcontinued.---At this time the youngeſt child evidently laboured under ſymptoms of teething; the cough, however, did not appear in the leaſt aggravated.—To the ſecond and third child, during the courſe of the nitrous vapour, no other medicine was given; but to the youngeſt, who was frequently conſtipated, a weak ſolution of antimon. tart. which always operated downwards, and ſometimes upwards, was occaſionally adminiſtered.

23d. The ſecond, and third child, continue well; and the youngeſt, though much diſtreſſed with teething, coughs but ſeldom, and very gentle.

Now, after having ſtated theſe facts, whether are not the nitrous vapour, had any effect in counteracting the contagion, or otherwiſe rendering the diſeaſe mild, and of ſhort duration; or whether or not the diſeaſe would have naturally appeared mild, and have continued but a ſhort time, without the interference of art, are points which I ſhall not take upon me to determine. Further trials are undoubtedly neceſſary for the purpoſe of forming a judgment. It muſt be confeſſed, however, that, even the few trials which have already been made, ſerve, in the mean time, a very uſeful purpoſe; they clearly ſhew, that even young children labouring under a diſeaſe, in which there is always, more or leſs, a determination to the lungs, &c. are capable of inſpiring the nitrous vapour without feeling from it any diſagreeable effects: hence there cannot, I preſume, be any objections to further trials of it being made in the hooping cough. Alſo, theſe facts lead naturally to other important inferences, but as they muſt be to you ſufficiently obvious, I avoid making them.

I have the honour to be, Gentlemen,
Your obedient humble ſervant,

Montroſe.
23rd *Sept.* 1797.

David Paterſon.

EXTRACT

OF A

LETTER

From Mr. Abraham Baſſan, *Surgeon of his Majeſty's Hoſpital Ship* Union, *to the Commiſſioners of Sick and Wounded Seamen, dated the* 22*d of* November, 1797.

" I USE the nitrous fumigation every day through the Ship, and, as formerly, in the ulcers, from the Sandwich, I found they ſpread and became foul from local debility, being never apparently benefited by the bark wine or generous diet, and I uſed the nitrous fumigation to the ulcers, after waſhing them clean, with great ſucceſs."

Three Letters from Mr. JAMES M'GRIGOR, *Surgeon to the* 88th *Regiment, at Jerſey. The two firſt addreſſed to Dr.* CARMICHAEL SMYTH, *and the laſt to Dr.* GARTHSHORE, *of London.*

Jerſey, October 8, 1797.

SIR,

As Surgeon to the 88th regiment, I have for theſe laſt four years, been witneſs to the dreadful ravages of an infectious fever in different quarters of the world. In England, in the iſland of Jerſey, on the continent of Europe, during a voyage to, and in different iſlands of the Weſt Indies, this fever has been the ſcourge of the regiment to which I have the honour to belong, and after a trial of every mode of practice which I could learn, it proved extremely fatal.

On my return from the Weſt Indies, having ſeen in Duncan's Annals of Medicine, an account of your work on fever, I determined to take the earlieſt opportunity of giving a trial to the mode which you recommended,

mended, of weakening and deſtroying contagion.

The 88th regiment, for nine months previous to their landing in Jerſey, had been in the moſt healthy condition; they landed on the 6th of June laſt, and continued in the ſame healthy ſtate till the middle of laſt July. On the 17th of July, the firſt caſe of a fever, which has ſince very generally prevailed, made its appearance. The perſon was ſeized with the worſt ſymptoms of low typhus fever, and died on the 5th day. Having four years before, in this iſland, in the courſe of ten weeks, loſt fifty men in the ſame fever, I determined to give the fulleſt and faireſt trial to any thing recommended by you. I had every aſſiſtance from one of the ableſt commanding officers, Col. Bursford.

To diffuſe the contagious poiſon, I ordered the men, on the firſt appearance of fever, to be moved from the barracks, (which are in an unhealthy ſituation) to tents pitched at ſome diſtance, on a dry and healthy ſpot.

To deſtroy the virulence of the contagion, where it evidently exiſted, I made my two mates regularly fumigate the barrack rooms

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and hoſpital with nitrous vapour, in the manner you direct, the event will ſhew the ſucceſs, of perhaps the firſt trial of your excellent invention, in the army.

Of fifty-four caſes of this fever, which occurred from the 17th of July to the 24th of September, the firſt is the only one that I have loſt. The very remarkable effect of the nitrous fumigation, appeared from the great diminution of the number taken ill, after it was uſed. During the firſt week twenty-four caſes appeared, in the ſecond week, ten, in the third, ſeven caſes; and to this date *, the number of caſes continue to leſſen.

The effect of the nitrous fumigation, is evident, not only in the diminiſhed number of caſes, but alſo in their degree of virulence. The caſes that have of late appeared, have been gradually becoming milder, and are now what a late writer would call caſes of ſimple fever, having neither petechiæ nor any dangerous ſymptom.

As your work on fever has but lately fallen into my hands, I have been able, only in few inſtances, to follow the practice which

* The 8th of October.

you recommend; every thing indeed has been ſo completely effected, by following your manner of deſtroying contagion, that, in general, little has been left for me, but to obviate debility.

If you ſhould wiſh to make any uſe of this communication, or ſhould favour me with any thing further regarding your truly valuable diſcovery, pleaſe addreſs for me to the care of our agent, A. M'Donald, Eſq. Pall-Mall court, London.

In a Memoir which I tranſmitted to the Army Medical Board lately, after an account of the fever which appeared in the 88th regiment, I gave an account of the ſucceſs of your plan, and thought it my duty to recommend it to the attention of the Board.

I have the honour to be

Sir,

Your very obedient humble ſervant,

JAMES M'GRIGOR,

Surgeon 88th *Regiment.*

Dr. Carmichael Smyth.

Jerſey.

Jerſey, December 9, 1797.

SIR,

BY a letter of yours of the 26th of October, with which I was favoured, I was happy to learn that my conduct had met your approbation.

In September laſt, I ſent to my friend Dr. Garthſhore, a copy of my Memoir to the Army Medical Board on the fever that lately prevailed in the 88th regiment. At his deſire, I about three weeks ago, ſent him an abridged account of two memoirs on this fever, which, I believe he intends to tranſmit to Dr. Duncan, for the ſecond volume of the Annals of Medicine. Preſuming that it would be ſatisfactory to you to ſee them, I herewith incloſe you copies of my firſt memoir, and of the abridged account ſent to Dr. Garthſhore. I had nearly finiſhed a ſecond memoir, and hoped to be able to have concluded my *ſtatement* of the fever, with an account of its extirpation; but a few more caſes have of late occurred. The appearance of theſe laſt caſes is however very naturally and eaſily accounted for, and the treatment of them adds a ſtill further teſti-

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mony to the efficacy of the nitrous fumigation, and of the treatment formerly purſued.

About the middle of October laſt, from the almoſt total diſappearance of the fever, we relaxed conſiderably in the fumigation, the only caſes then in the fever-hoſpital, were convaleſcents from fever. About this time, the different encampments breaking up, we were obliged to admit a good many pneumonic and ſome dyſenteric caſes which crowded this ſmall hoſpital, (an old farm-houſe hired for an hoſpital) and I was alarmed to ſee the fever break out again with all the original ſymptoms in ſix or ſeven convaleſcents. By attention to the different circumſtances regarding fumigation, following the former treatment, and thinning the different rooms, matters are now brought to nearly the ſame good ſtate as before the re-appearance of the fever.

The re-appearance of the fever, has however, not been entirely without its advantages, it has been the means of ſhewing me a fact, which eſpecially in military practice, I conceive to be of the firſt importance. It has pointed out to me the efficacy of the nitrous fumigation in deſtroying dyſenteric con-

contagion. I have often been witneſs to the rapidity with which the contagion of dyſentery flew through the wards of an hoſpital, and how apt convaleſcents from other diſeaſes, and in particular from fever, were to be ſeized with this diſeaſe. Though thirteen caſes of dyſentery were ſent to the hoſpital, and ſome of them with very ſevere ſymptoms, I know only of two inſtances where the diſeaſe was communicated in the hoſpital, and with the exception of two chronic caſes, the cure in all, has been much ſpeedier than I have formerly ſeen it under the ſame treatment.

Confident of ſucceſs, I wiſh much for opportunity of trying the fumigation in other contagious diſeaſes, particularly ſmall pox. In two caſes of cynanche, attended with low fever, I uſed it, and both patients (officers) are now well. I ſhould be glad to hear if you have extended the trial to other diſeaſes.

Some other circumſtances regarding our fever, I think proper to mention to you.

So ſanguine was I at one time, in my expectations from the fumigation, that in ſome caſes of the fever which I ſet apart, I truſted ſolely to nature and induſtriouſly fumigating, but

but I ſoon ſaw that in theſe caſes I was rapidly loſing ground. I next in conjuction with the fumigation, followed Dr. Cullens' plan of treatment; this in every caſe protracted the cure, and in ſeveral inſtances, I was obliged totally to abandon the plan. Being in poſſeſſion of ſuch powerful means of deſtroying the contagion, as the nitrous fumigation, I ventured to take the opportunity of giving tryal to, and comparing ſeveral of the modes of practice recommended in fever; but a compariſon of caſes as nearly equal as could be collected, gives the moſt decided ſuperiority to that recommended by Dr. Robertſon of Greenwich. But I think it likewiſe proper to mention, that under the type which fever lately aſſumed in this iſland, however proper the immediate exhibition of the bark was here, that it was by no means found ſo proper a remedy in other ſituations. In the Weſt Indies, every trial given to the bark in the yellow fever during the paroxyſm, failed, and this not only with me, but in the hands of the phyſicians who had the charge of the largeſt hoſpitals there.

I ſhall never ſufficiently regret my being unacquainted with your diſcovery, while in the Weſt

Indies;

Indies; and though doubtleſs it will for a time, meet with the fate of every other that has been made for the benefit of mankind; yet, if candid and liberal practitioners will but do their duty, and give it a trial, I am confident it muſt ſoon carry conviction, and that you will derive that credit from it, which you ſo juſtly deſerve.

I have for ſome time been in the practice of keeping journals of my caſes; every caſe of this fever that has occurred ſince its origin, has been regiſtered either by myſelf or by one of my aſſiſtants. The garriſon ſurgeon here, and his aſſiſtants likewiſe, have witneſſed the treatment: and the different facts mentioned in my memoir, are not unknown to ſeveral practititioners in the iſland. Any information which you may require from me at any time, regarding the trials of the nitrous acid, and the other means recommended by you, I ſhall moſt readily give.

I have the honour to be
With the greateſt reſpect,
Sir,
Your moſt obedient humble ſervant,
JAMES M'GRIGOR.

Dr. Carmichael Smyth.

St.

* *St. Owen's, Jerſey, Nov.* 1, 1797.

SIR,

As perhaps the confirmation or refutation of an *opinion* in medical ſcience, eſpecially of one that ſo nearly concerns mankind in general, as a mode of obviating contagion, is not leſs uſeful than a new theory, a new medicine, or a new mode of curing a diſeaſe; I ſhall lay before you ſome facts, which, I think, confirm the method of obviating and expelling febrile contagion, which has been recommended by Dr. C. Smyth.

On the 17th of July laſt, a contagious fever of the typhus form, appeared in the 88th regiment in this iſland. In different ſituations, this regiment had ſuffered ſeverely for the laſt four years, from a fever of the ſame kind. In this iſland, three years ago, I had the misfortune to loſe, in the courſe of ten weeks, forty † men from this fever. Soon

* This letter has been already publiſhed in the ſecond volume of the Annals of Medicine, and is only republiſhed here from a wiſh to bring the whole of the evidence on this ſubject into one point of view.

† There ſeems to have been a miſtake here, as in his firſt letter to me, he ſtates the number to have been fifty.

after our arrival in Jerſey, in laſt June, and but a ſhort time before the firſt caſe of this fever appeared, Dr. Smyth's work on fever came into my hands: I, therefore, on the firſt appearance of the fever, gave the fulleſt trial to the uſe of the nitrous acid, and as the reſult ſhews, with the beſt ſucceſs.

The account which I here give, is extracted from two official memoirs, which I tranſmitted to the Army Medical Board on the ſubject.

The fever had nothing remarkable in its appearance from typhus fever, as I have uſually ſeen it occur, if I except the ſuddenneſs of the attack, often with delirium or epilepſy; a very remarkable degree of debility; and a great proneneſs to relapſe. Two caſes had the ſcarlet eruption with angina, and moſt of the firſt caſes, until they were ſent to camp, and were expoſed to a current of air, had petechiæ. In moſt of the firſt caſes, the contagion could be clearly traced.

On the firſt appearance of this fever, alarmed at the fatal iſſue of the firſt caſe, I myſelf not only carefully fumigated the hoſpital, the cloaths, and bedding of the ſick, with nitrous acid, but my two aſſiſtants,

Meſſrs.

Meſſrs. Bruce and Brown, likewiſe conſtantly fumigated the different barrack-rooms*.

Every man as ſoon as ſeized with the fever, was removed from the barracks, which are unhealthily ſituated, to tents pitched in a dry and airy ſituation, about a mile diſtant. The barracks were likewiſe thinned by encamping or removing from them, near half the regiment.

The *treatment* in general was, by immediately exhibiting the bark after giving an emetic or cathartic, and afterwards giving cordials, bliſters, &c. as indicated. The lavatio frigida, in ſeveral caſes, ſeemed to anſwer exceedingly well.

The *firſt* caſe, which appeared on the 17th of July, died on the fifth day, with ſymptoms which are uſually called highly putrid. This excited a very general alarm in the regiment.

I ſhall here from my journal of caſes, and the copies of reports made to the Medical Board, give a ſtatement of the appearance of the caſes of the fever: nothing can afford

* The rooms, by this proceſs, were rendered ſweet, and the men themſelves ſoon became ſenſible of the comfort of it. Vide firſt Memoir ſent to the Army Medical Board.

ſtronger proof of the efficacy of the means adopted to obviate and remove this diſeaſe.

From July 17 to July 28, 20 caſes appeared.
From July 29 to Aug. 4, 16 —— ——
From Aug. 5 to Aug. 11, 10 —— ——
From Aug. 12 to Aug. 18, 8 —— ——
From Aug. 19 to Aug. 25, 3 —— ——
From Aug. 26 to Sept. 1, 2 —— ——
From Sept. 2 to Sept. 8, 4 —— ——
From Sept. 9 to Sept. 15, 1 —— ——

From this time, till the ſick were removed from the tents, to a houſe where they were crowded, hardly another caſe appeared. At this period, however, about the 20th of October, the fever with the original ſymptoms again appeared among ſome convaleſcents and pneumonic caſes; but by putting in practice the nitrous fumigation, and thinning the wards of the hoſpital, the fever was again very ſoon got under.

Of the total number of caſes of this fever that occurred, viz. ſixty-ſix*, the firſt is the

* A very large proportion this of the regiment, which conſiſted only of four hundred men.

only one that was loſt; this, no doubt, is remarkable, and I not only aſcribe this ſucceſs to the uſe of the oxygenated nitrous acid, but I likewiſe think it highly probable, that by fumigating with this acid, the contagion is now nearly extinct, and that by its uſe, more caſes of this fever have been prevented from apppearing.

I have nothing at preſent to add to what Dr. Smyth has ſaid of the uſe of the nitrous acid; every trial which I have made hitherto, tends to confirm his experiments. I have ſet on foot a trial of different other acids*, which however is yet ſo incomplete, as not to allow me to ſay any thing of their comparative merits. Juſtice to the author of ſo valuable a diſcovery, and a wiſh to make more public, what is ſo intereſting to mankind, has induced me to ſay ſo much †.

I am, &c.

Dr. Garthſhore,
London.

JAMES M'GRIGOR.

* We attempted, likewiſe, the extrication of the muriatic acid gas, but with great inconvenience, and it is obviouſly not ſo proper as the nitrous. Vide firſt Memoir.

† I am very confident, that in various ſituations the attaching to every regiment one large tent, and allowing the materials for the nitrous fumigation, would materially benefit the ſervice. Vide firſt Memoir.

For the following COMMUNICATIONS, *I am indebted to my Friend Dr.* JOHNSTON.

Queen Street, Portſea, December 23, 1798.

DEAR SIR,

WHEN I had the pleaſure of ſeeing you at Porſmouth, I had experienced the good effects of the nitrous fumigation in arreſting contagion, and would have communicated my obſervations to you on this ſubject ere now: but unfortunately the diſeaſe has been *reintroduced*, by receiving men ill of typhus fever, and dyſentery, from the Hillſborough tranſport, bound to New South Wales with convicts. I am, therefore, ſtill purſuing Dr. Smyth's method of fumigation, and am happy to ſay, that, I have, a ſecond time, experienced the moſt happy and beneficial effects from it. I will, as ſoon as poſſible, forward to you, through Mr. Palmer, the particulars of my ſucceſs, and one advantage, at leaſt, will ariſe from this unavoidable delay, viz. the pleaſure of ſeeing the fumigation ſucceed a ſecond time, under the very unfavourable

unfavourable circumſtances of *bad weather*, and direct communication with the ſaid tranſport, from on board of which twenty-two ſick convicts have been received, and placed under my care at Langſtone harbour. I believe if we had not received the ſaid twenty-two men, that we ſhould not at preſent have a ſingle ſick man among the convicts.

I am, &c.

(Signed) SAMUEL HILL.

Dr. Johnſton.

Queen Street, Portſea, January 13, 1799.

DEAR SIR,

HEREWITH I have the honour of forwarding to you ſome remarks I have made on the effects, very happy effects, of the nitrous acid fumigation, in ſtopping the progreſs of a contagious fever on board the hulks in Langſtone harbour; and I am happy to convey to you my decided opinion in its favour: an opinion, not haſtily formed, but founded on facts, which occurred on trying

that excellent method of preventing, and leſſening ſome of the miſeries of our fellow-creatures.

I will eſteem it a particular favour, if you will peruſe the incloſed letter, and forward it to Dr. Smyth.

I remain, dear Sir, &c.

(Signed) SAMUEL HILL.

Dr. Johnſton.

Portſea, January 13, 1799.

SIR,

HAVING with great pleaſure peruſed your publication on the fever, which prevailed among the Spaniſh priſoners of war at Winchester, and alſo, your account of the ſucceſs attending the nitrous fumigation, in deſtroying contagion on board the Union hoſpital ſhip, and on board a ſquadron of Ruſſian ſhips of war at the Nore; I determined to try its effects on board the hulks in Langſtone harbour, near this town, the firſt opportunity that might offer.

A fever

A fever of a contagious nature made its appearance on board the ſaid hulks, in the month of July 1798, which ſoon became alarming, not from the number of ſick only, but from the rapidity with which it advanced to its laſt, or fatal ſtage. The number of patients continued increaſing from the 6th of July, to the 29th of Auguſt; in the former month ſixteen were received, in the latter ſixty-ſix. Upon my repreſenting to Mr. Dyne, contractor for the care of convicts on board the ſaid hulks, that I thought great benefit would enſue, if the method of fumigating recommended by you, was put in practice at Langſtone harbour, he with a liberal hand ſupplied the concentrated vitriolic acid and nitre, and humanely ordered, that no expence might be ſpared in attempting to ſtop the progreſs of the fever.

Pipkins, &c. were procured here without loſs of time, and we began fumigating on board the Sincerity hoſpital ſhip, on the 29th of Auguſt, 1798, at which time it contained fifteen very ill of fever, fifteen recovering from fever, (and three of other complaints left in July) thirty-one had returned

turned to the priſon cured, and five had paid the debt of nature.

It was with extreme pleaſure I obſerved the effects of the vapour on many of the fever patients. I will ſtate them on one, which, with little variation, will ſerve for the reſt.

Daniel Stowell, aged twenty-ſeven, was received into the hoſpital-ſhip on the 21ſt of Auguſt, where he had continued getting worſe till the commencement of the fumigation; he was then in the following ſtate. A moſt ſevere and confuſed pain in his head, with intenſe heat on the ſkin, and inſatiable thirſt; tongue rough and extremely dry, appearing like a burnt cruſt, and of a blackiſh colour, inability to put it out of the mouth when deſired; teeth and gums covered with the ſame kind of fur as the tongue. Pulſe one hundred and thirty-one, ſmall and weak. The vapour made him cough very much, and he requeſted (his own words) *to be ſmoked no more*; it was, however, repeated three times this day. Auguſt 30, Pulſe one hundred and one, and ſtronger, ſome moiſture on his tongue and gums, heat on the ſkin greatly decreaſed; head-ach much the ſame;

thirſt

thirſt not ſo intenſe: fumigated three times this day. Thirty-firſt, He was in every reſpect better; continued the fumigation three times. September 1ſt, Pulſe ſeventy-nine, and ſtill ſtronger than the two preceding days; other ſymptoms much relieved: continued the fumigation. Second, Pulſe ſixty-eight, ſtrong and regular; his appetite permitted him to take more nouriſhment than he had been able to do ſince his illneſs: from this day to the ninth, he continued getting better, and I now conſidered him in a ſtate of convaleſcence.

It is proper here to remark, that this man had an ulcer on his right leg, extending from the outer ancle acroſs the anterior part of the tibia to the gaſtrocnemius muſcle, at which part it was four inches broad and very deep, and diſcharged a thick ill-conditioned matter, which was very offenſive. Its length was rather more than ſix inches. After ſome days fumigating, I obſerved a change for the better in the appearance of the ulcer, and as I had tried a variety of methods to heal it, for many months before he became ill of the fever, without producing any good effect; I laid this change to the effects of the vapour. I now directed it to the ulcer itſelf, and continued

tinued its uſe till October the 30th, when his ulcer was cicatriſed; and I verily believe, to its efficacy is owing this poor man's cure. He is gone to New South Wales in the Hillſborough, which ſailed juſt before Chriſtmas laſt; I ſaw him the day before he embarked on board her, and the cicatrix was very firm: the ulcer was the conſequence of an old gun-ſhot wound.

There is another caſe of ulcer which I think has mended greatly ſince I fumigated it; I am proceeding as in the former caſe, and I have great reaſon to believe it will ultimately prove ſucceſsful. The only dreſſings uſed during the fumigation, or more correctly ſpeaking, after the commencement of the fumigation, were dry lint and ung. reſin. flav. over which was laid a rag of linen, conſtantly kept wet with aqua. lytharg. acetat. diluted with water.

Finding ſuch beneficial effects from the fumigation on board the hoſpital ſhip, in bringing the fever ſooner to a concluſion, by ſhortening all its ſtages, I determined to apply it to the ſource of the contagion; and accordingly the priſon-hulks, la Fortune and Ceres were fumigated every night from Octo-

ber

ber the 15th to November the 20th, (except two nights, the ſervant who was ſent for the acid to town (Portſea) having ſtaid the firſt night at a public houſe, and did not arrive in time to fumigate the next night,) and I had the pleaſure of finding the ſick reduced to eight; and ſeven days had elapſed, and not one patient had been ſent to the hoſpital-ſhip. The fumigation was now diſcontinued.

November the 21ſt, eight men were received from the Hillſborough Botany Bay ſhip, one of which number was in the laſt ſtage of a contagious fever, and two laboured under dyſentery. Several patients in a ſtate of recovery caught the new contagion, and many attendants were taken ill with the diarrhœa and dyſentery; and as it was impoſſible to prevent communication with the priſon-hulks, the priſoners again became ſickly, and many died; ſome of whom were not ill three days before that awful event took place; and one man in particular died delirious twelve hours after he was received into the hoſpital-ſhip.

The fumigation, which I conſidered as the anchor of hope, was again reſorted to No-

vember

vember the 26th, and continued to the preſent time, January the * 13th, 1799; and it is with ſuperlative ſatisfaction I add, that there has not been a patient received for the laſt eighteen days, neither is there a ſingle fever patient in the hoſpital.

It is not my intention, neither is it neceſſary, to trouble you with a detail of my method of treating this fever; what I have to ſay relating only to the happy effects of the fumigation, and it is with peculiar pleaſure I aſſert, that the progreſs of the fever has been *twice* completely arreſted by perſeverance in its uſe; it may, however, be neceſſary and proper to ſay a few words on its firſt introduction, and on its fatal effects on many who were its victims; I will, therefore, relate the caſe of one patient, which will ſhew inconteſtibly the nature of the diſeaſe.

The firſt perſon taken ill, was John Smith, a convict, who had been ſent from Newgate a ſhort time before. He informed me, July

* Dr. Smyth will be pleaſed to add three days more to the time which had elapſed on Sunday laſt (the 13th) without having received any patient whatever from the hulks into our hoſpital-ſhip.—Poſtſcript of a Letter to Dr. Johnſton, dated the 16th of January.

6th,

6th, 1798, the day he was received on board the hoſpital-ſhip, that he had been ill of a fever in Newgate, and had not recovered his ſtrength when he was ſent to the hulks, at Langſtone harbour. The convicts having been remarkably healthy, previous to the reception of this man, and becoming very ſickly immediately after his admiſſion, I conſidered the fever as introduced by him. He complained this day, (July 6) of head-ache; pains in his back, loins, and extremities; his ſkin was very hot and thirſt great; tongue covered with a yellowiſh mucous; countenance of a yellow tinge, and great dejection of ſpirits; pulſe ninety-ſix, and weak. Seventh, All his ſymptoms ſeemed agravated, his pulſe one hundred and ſeventeen. Eighth, He was delirous, and required, at leaſt, two attendants to keep him in his cradle; pulſe one hundred and forty. Ninth, He was covered with myriads of petechiæ, and became extremely offenſive: I was now unable to reckon his pulſe. Tenth and eleventh, His petechiæ had run into each other ſo as to form large blotches. Twelfth, There was a great diſcharge from his noſe and ears, of a very dark colour and very thin. Thirteen and fourteen,

The

The ſtench from him was offenſive in the extreme. On the fifteenth, he died univerſally convulſed.

The annexed Table will ſhew the numbers taken ill before and after the commencement of the fumigation. The 9th and 10th of november were the days on which it was omitted, and it is remarkable, that although on the former day no patient had been ſent to the hoſpital, on the two ſucceeding days ſeven were brought each day.

I have not, Sir, the honor of being known to you; but liberality and love of truth induce me to forward to you the above particulars, which I hope will be received as a token of that eſteem and regard with which

I am, Sir,

Your moſt obedient humble ſervant,

SAMUEL HILL.

Dr. Carmichael Smyth.

N. B. There were 748 convicts on board the two hulks on the 6th of July, 1798, of thoſe, 418 were received into the hoſpital with the jail-fever, beſides 24 from on board the Hillſborough. Total 442, of whom 71 died of the diſtemper.

A Monthly

A Monthly and Daily RETURN of the CONVICTS attacked with the Jail-Fever on board the Hulks, and received into the *Sincerity* Hospital Ship in Langstone Harbour, from the 6th of July to the 26th of December, 1798. By S. HILL, Surgeon to the Hospital.

Months	Days	Numbr
July	—	— 16
Aug.	—	— 60
Sept.	—	— 120
Oct.	1	5
	2	3
	3	7
	4	11
	5	3
	6	7
	7	3
	8	4
	9	2
	10	2
	11	6
	12	8
	13	3
	14	5
	*15	9
To the 16th		77

Month	Days	Numbr
Oct.	16	3
	17	2
	18	1
	19	2
	20	3
	21	4
	22	3
	23	1
	24	3
	25	2
	26	1
	27	2
	28	1
	29	1
	30	0
	31	1
To the 31st		30

Month	Days	Numbr
Nov.	1	1
	2	1
	3	—
	4	1
	5	—
	6	3
	7	1
	8	1
	9	—
	10	7
	11	7
	12	3
	13	1
	14	—
	15	—
	16	—
	17	—
	18	—
	19	—
	*20	—
	21 H	—
	22	—
	23	1
	24	7
	25	4
	*26	2
	27	3
	28	2
	29	2
	30 H	3
		50

Month	Days	Numbr
Dec.	1	3
	2	2
	3	3
	4	5
	5	—
	6	5
	7	4
	8	3
	9	2
	10	2
	11	3
	12	2
	13	1
	14	2
	15	1
	16	3
	17	2
	18	2
	19 H	6
	20	2
	21	2
	22	3
	23	2
	24	1
	25	1
	26	2
		64

* On the evening of the 15th of October, we began to fumigate the hulks, and continued to do so every day to the 20th of November, (the 9th and 10th of this month excepted;) on the 20th, the fumigation was discontinued, but resumed on the 26th, and continued without interruption to the 13th of January, 1799, though on the 26th of December the sickness had intirely ceased.

[H] On the 21st of November, eight persons ill with the jail-fever, or dysentry, were received into the hospital, from on board the Hillsborough Botany-bay ship, outward-bound; eleven more were received on the 30th of the same month, and five on the 19th of December: in all, twenty-four.

SIR, *Forton Hoſpital, Jan.* 17, 1799.

A friend of mine having informed me that you were preparing for the preſs ſome additional experiments, to prove the utility of the nitrous acid fumigation, in deſtroying contagion, I take the liberty of ſubmitting to your notice ſome facts which have occurred to me on this ſubject. If you will honour them with a peruſal, and think them of ſufficient importance, I ſhall feel myſelf highly flattered, ſhould they, through your ſanction, become more publicly known.

From the 4th to the 12th of April, 1797, we were employed at this hoſpital in receiving priſoners infected with the jail fever. Theſe men had recently arrived in ſome tranſports from Wales: They formed part of a new regiment who had landed there, and who, previous to their ſailing from Breſt, had been releaſed from various priſons in France.

This fever was generally attended with petechiæ, and, in ſome caſes, the parotids were affected. From theſe ſymptoms, and from its being highly contagious, it was thought immediately neceſſary to fumigate with the nitrous acid in greater quantity than we had hitherto

hitherto done, and, inſtead of *three* fumigating pipkins in each ward, we increaſed them to *ſix*. This method appeared to have a very deſirable effect, for by filling a fever-ward with the vapour to ſuch a degree that the ſmalleſt part of it could not eſcape the influence of the nitrous gas, we never failed to render the air of that ward ſweet and refreſhing for ſome hours. Here I muſt beg leave to remark, notwithſtanding the prejudices that are abroad, that I never remember the vapour having appeared too powerful for any fever-patient to bear, and although phthiſically inclined myſelf I could always bear it without inconvenience. If, however, ſome inconvenience ſhould occur, I conceive it only a ſecondary object of conſideration, when compared with the good effects to be derived from the fumigation, in checking contagion.

The increaſed demand for the nitrous vapour, from the number of wards occupied in the hoſpital, occaſioned the conſumption of nearly three pints of the concentrated vitriolic acid, and a proportionate quantity of the purified nitre, each day. The expence of ſo encreaſed a conſumption, if an object, is certainly over-balanced by the conſiderable

advantages reſulting from its uſe; for, notwithſtanding freſh contagion was every day brought into the hoſpital till the month of July, by means of priſoners received from the priſon-ſhips, we had the ſatisfaction to ſee the malignity of the fever ſubdued; and by the unremitted attention of the phyſicians of the royal hoſpital at Haſlar, with a due obſervance of cleanlineſs, we were authoriſed early in the month of Auguſt, to report to the commiſſioners for ſick and wounded ſeamen, that the jail fever which lately raged among the French priſoners at this port, exiſted no longer. The priſoners then, in proportion to their number, enjoyed an uſual ſhare of health, and which, previous to the introduction of the jail-fever, had been equal to the ſtate of health of any number of working men in the manufacturing towns of England.

During the continuance of the jail-fever, *very few* of the eſtabliſhment of the hoſpital caught the diſtemper, conſidering the length of time it prevailed at Forton. Thoſe who received the contagion firſt, and were fond of drinking, either died, or had a very ſevere illneſs. Others, not ſo partial to liquor,

and

and who received the infection later, in general recovered.

No putrid diſeaſe of any conſequence made its appearance again in the hoſpital until the 3d of January, 1798, when we received ſome priſoners from his Majeſty's priſon-ſhips, Fame and Portland. Theſe men, who had lately arrived in a tranſport from Falmouth, were affected with jail-fever; and on many of them petechiæ appeared. I immediately acquainted the commiſſioners for ſick and wounded ſeamen of the circumſtance, who gave orders to the phyſicians of Haſlar hoſpital to viſit Forton, and report to them accordingly.

At this time the government of France had agreed to victual, cloath, and attend in ſickneſs, their own priſoners. The ſub-contractor in the medical department did not, however, take charge of the hoſpital at Forton, till the 11th of February following. We had, previous to that time, an opportunity of fumigating with the nitrous acid with apparent good effect. The buſineſs of the hoſpital from that time, came under the guidance of the French, but although they had two hundred and eighty-two patients put

under their care, and upwards of one hundred of them affected with putrid fever, the acid vapour was totally diſcontinued for near five months. The ſtate of the hoſpital, from the 11th of February, was highly alarming, and extremely unfavourable to the health of the priſoners; the number on the hoſpital books increaſed daily, the wards were ſo neglected that they ſoon appeared dirty, and had an offenſive ſmell; the œconomy of the buildings were not at all ſtudied for the advantage of the ſick; fever and convaleſcent patients were not ſeparated, and in the courſe of twenty weeks two hundred and thirty-five priſoners died, five hundred and thirty-ſeven remained ſick in the hoſpital; and the jail-fever was raging with great violence.

On the 20th of May, Doctor Forzy, and Mr. Brunet, Surgeon, arrived here from France, who were appointed by the French government, inſpectors over their ſick and wounded priſoners in England. Theſe gentlemen were placed at this depôt to ſee that juſtice was done to the French priſoners. As they were verſed in the management of hoſpitals, they ſoon perceived the great inattention that had been paid to the ſick; and the irregular

gular manner in which the duty of the hoſpital was carried on. They ſoon convinced Mr. Vochez of this ſituation of the ſick priſoners, who loſt no time in breaking the contract, and putting the management of the hoſpital into other hands, thinking it preferable to ſubject himſelf to the penalties of the law, than that one helpleſs priſoner ſhould ſuffer by the hand of inſatiable avidity and unfeeling neglect; a tranſaction highly honourable to Mr. Vochez, and the memory of which ſhould always remain ſtrongly impreſſed on the minds of thoſe who were, or might be thereby benefited by it.

On the 1ſt day of July, Dr. Forzy and Mr. Brunet commenced the management of this hoſpital in the medical department. Their chief object was to put the buildings into a general ſtate of cleanlineſs, and to fumigate the wards of the hoſpital with the nitrous acid. For this purpoſe Mr. Vochez very liberally purchaſed all that remained in the Engliſh ſtore, and likewiſe ſent down from London a large quantity of the concentrated vitriolic acid and purified nitre. The acid vapour, together with the new ſyſtem of cleanlineſs, at the expiration of even ſo

ſhort a period as ſeven days, cauſed a very ſenſible change in the appearance of the patients, and the deaths, which during the previous week amounted to *eighteen*, were reduced to *ſix* the firſt week after the new adminiſtration took place. Every ſucceeding week a more healthy aſpect preſented itſelf. At the end of the tenth, the hoſpital might be perceived to have nearly approached a ſtate of general convaleſcence. The number of contagious patients received from Portcheſter Caſtle, and the priſon-ſhips, were indeed conſiderably leſſened; yet the deaths which had occurred, were *ſixty-nine* in number, although the patients in the hoſpital were reduced to two hundred and ſeventy-three. In the next enſuing ten weeks, the deaths decreaſed to thirty-ſeven; the number of patients was two hundred and eighty-ſix. At this time all contagion had left us, and we had not received a patient with putrid fever, from Portcheſter or the priſon-ſhips, for near three weeks; and I have great pleaſure in ſtating, that we have remained in the ſame healthy ſtate ever ſince, and have not more than three hundred ſick in the hoſpitals of Forton and Portcheſter, though they contain

the

the ſick of near ten thouſand priſoners at this port.

I cannot help expreſſing the great praiſe that is due to Dr. Forzy and Mr. Brunet, for their very meritorious exertions in forming ſuch ſalutary arrangements, and putting the hoſpital into ſuch excellent diſcipline and order, and particularly for their uncommon zeal, and the indefatigable pains they took to ſee the hoſpital well fumigated with the nitrous acid, which there cannot be a doubt was exceedingly inſtrumental in crowning their urgent endeavours with the deſired ſucceſs.

From the foregoing ſtatement, I think no one can heſitate to beſtow the high encomiums that are due on this moſt excellent invention and its ingenious author, to whom every member of ſociety ſhould always think himſelf highly indebted.

I am, Sir,
With great reſpect,
Your much obliged humble ſervant,

JOHN GRIFFIN.

Jas. Carmichael Smyth.

Portſea,

Portſea, December 16, 1798.

DEAR SIR,

IN anſwer to your favour of the 11th inſt. I have very little to add to what I have ſaid in my weekly reports, wherein the obvious difference of thirty the firſt week, and only three the next, being attacked with typhus, I in a great meaſure attribute to the nitrous fumigation, uſed in the way recommended by Dr. J. C. Smyth, from which it alſo appears, that of thirteen ill in this latter time, I had only occaſion to ſend two to the hoſpital, and that the infection was ſo far ſubdued, that even nine got well on board, by the emetics, antimonials, &c. uſed in the firſt ſtage of the diſeaſe, which I had not been able to accompliſh previous to the uſe of the nitrous fumigation; I muſt alſo add, that the keeping fires conſtantly burning, and the ſending thoſe to the hoſpital who were firſt taken ill, might have ſome good effect; but the weather was ſo inceſſantly bad, we could not take advantage of wind ſails, and indeed laboured under every other inconvenience; the Defiance's ſhips company at this time, being on board the Elephant (a ſeventy-

(a ſeventy-four) as a hulk, in the harbour. I imagine that the typhus fever was introduced into the ſhip by women, two of whom I ſent on ſhore as ſoon as I diſcovered, one with a ſcarlet eruption, and certain degree of fætor—Both Dr. Lind and Dr. Hope, are of opinion, the fever was of a very dangerous and infectious nature, and from Dr. Hope's opinion, I was more particularly led to be very attentive in removing the ſick early to the hoſpital, but the nitrous vapour was ſcarcely uſed two days, when the ſymptoms abated, and has now entirely ceaſed.

The method I uſed, was by holding the pipkins under the hammocks of thoſe with feveriſh ſymptoms, and at night, eight were carried about the decks, when all the hammocks and people were below, and this was attended with very little inconvenience to thoſe in health. I have alſo uſed the nitrous vapour in the manner mentioned by Mr. Paterſon for ulcers and foul ſores, and I think, with obvious good effect, at leaſt the patients themſelves acknowledged it. I in general have a pot in fumigation, when I viſit the ſick in the cock-pit, which I really think, independent of the utility of applying ſores

over

over it, tends to purify the air and diſpel fætor, its ſmoak is particularly pleaſant to me, and I often have it in my cabin, when the ſick are below. I ſhall be happy if theſe curſory obſervations appear to you at all ſatisfactory.

And I ever am,

Your obedient ſervant and friend,

JAMES GLEGG.

J. Johnſton, Eſq.

Norman Croſs, Auguſt 8, 1798.

DEAR SIR,

AGREEABLY to the wiſh you expreſſed, of being informed of any obſervations I might happen to make on the effects of the nitrous acid fumigation, in checking or deſtroying contagion; I have for a conſiderable time paſt, carefully attended to the conſideration of that ſubject, eſpecially ſince I read Mr. Paterſon's ingenious letter addreſſed to the Commiſſioners of the Sick and Wounded Board: and although I have not been

been able to draw ſimilar concluſions, with reſpect to its beneficial effects on patients afflicted with ulcers, it is becauſe I was leſs obſervant and attentive perhaps, to that point, not having peruſed this gentleman's publication previous to my adopting a more ſucceſsful mode of treating ulcers, I hope, than is generally practiſed or known.

Whither the nitrous vapour has peculiar ſpecific powers for deſtroying contagion, is difficult to ſay. I have conſtantly fumigated the hoſpital wards three times a week, ſometimes oftener, and I have ſtrong reaſon to believe that the nitrous acid fumigation not only tends to prevent the ſpreading of contagion; but anſwers other ſalutary purpoſes.

Among the various trials I had occaſion to make with the intent of aſcertaining its effects on putrid effluvia, a circumſtance occurred worthy of notice. The water cloſet adjoining the agent's office, became in the very hot weather of June and July laſt, ſo extremely offenſive, that Mr. Perrot and his clerks complained, that unleſs the fætor was in ſome degree removed or mitigated, it would be impoſſible to continue much longer in the apartment. It is a room of twelve

feet

feet ſquare: I ordered three pipkins in, and proceeded to fumigate for an hour, filling the place completely with the nitrous vapour. During this period, the door was unavoidably opened ſeveral times; but the agent, two clerks, and myſelf, continued there the whole time. It at firſt cauſed a little coughing; but in a few minutes that irritation ceaſed, and the vapour became rather grateful than otherwiſe. At the end of forty-five minutes, Mr. Gardner one of the clerks, declared he had felt for ſome time, an unuſual ſenſation of hunger, which at the concluſion was extremely importunate, and he that day ate, as he expreſſed himſelf, voraciouſly. Mr. Richards the other clerk, felt nearly ſimilar effects, though not ſo much expoſed to the vapour as the former, who kept ſtirring one of the pipkins frequently. As I did not feel ſenſations of a ſimilar nature at the time, I paid little attention to their obſervations; but on returning home, ſomewhat better than an hour after, my ſtomach became equally importunate and craving for food, in ſo much ſo, that it was with the utmoſt difficulty I could refrain till the uſual hour of dining;

and I may venture to ſay, that I ate nearly twice my ordinary quantity on that day.

Ten days after this I had the wards more than uſually fumigated, in which I remained till the expiration of the proceſs, and I felt equally affected with hunger, but although a more than common degree of flatulency attended it. I ought to mention that the agent's apartment was rendered perfectly ſweet and pleaſant, the fætor being wholly removed or deſtroyed. Mr. Perrot was ſo ſenſible of the change, that he requeſted ſome days after, to have the fumigation repeated, becauſe the ſmell was again becoming offenſive.

Do not theſe facts evince the propriety of diffuſing the nitrous vapour copiouſly in the convaleſcent wards, where loſs of appetite, and want of tone in the digeſtive organs, often retard the perfect reſtoration of health?

Another circumſtance well deſerving our regard, with reſpect to the effect of the nitrous fumigation on contagion, occurred. Some time ago we had nearly forty patients in the Dutch hoſpital dangerouſly ill with typhus fever; old men who had been recently captured in the Greenland ſhips, and

who

who laboured under great dejection of ſpirits. They were taken ill in the priſons, ſhortly after their arrival at Norman-Croſs, and although we had a great many patients with ſlight complaints in the hoſpital, on the admiſſion of thoſe with typhus fever, yet not one of them, nor of the nurſes, caught the diſeaſe.

This was not the caſe in the priſons, for ſeveral of the old ſtandards there, were attacked with the fever. During the continuance of the diſeaſe, we were unremitting in our attention to fumigate the wards of the hoſpital daily, with the addition of ſeveral pipkins more than were commonly employed.

Are we not warranted then, in concluding that theſe prophylactic meaſures, prevented the contagion from ſpreading and infecting the patients in the hoſpital; whilſt thoſe in the priſons not having equal advantages, were attacked with the fever?

We were however fortunate enough to loſe no more than one patient, who died on the ſeventh day in a highly putrid ſtate; a clear proof of the malignant tendency, and contagious nature of the diſorder.

I could

I could enumerate a variety of other inſtances, where it appeared to me that the nitrous acid fumigation was attended with ſalutary effects; but what has been already ſaid is, I hope, ſufficient to ſhew that many benefits are likely to accrue from a more extenſive uſe of this medicine; and that it ought almoſt on every occaſion, to have the preference to all other modes of fumigating, where contagion is prevalent.

It might certainly be uſed with much propriety and advantage in the ſick berths, and between decks, on board his Majeſty's ſhips of war. It is true, where great moiſture prevails, which is unavoidably the caſe in men of war, fires are abſolutely neceſſary; after which the nitrous gas ſhould be liberally diffuſed throughout the ſhip: but prejudice, which frequently warps the beſt underſtanding, prevents many from adopting ſalutary meaſures, becauſe theſe means had not been originally ſuggeſted by themſelves, or becauſe they happen to militate againſt ſome preconceived and favourite opinion.

But before gentlemen decide on any remedy held out to the public in a fair and candid manner, they ſhould firſt ſubject this

remedy to actual experiment, and then determine for or againſt it, according to the unprejudiced reſult.

I do not pretend to ſay that the nitrous acid ought to ſuperſede all other preventive remedies; on the contrary, ventilation and cleanlineſs muſt likewiſe be conjoined with it: but where contagious fever prevails, there is every reaſon to believe that theſe will prove the moſt effectual external means to ſubdue it.

I thought it my duty to ſay thus much in juſtice to the ingenious inventor of the nitrous acid fumigation.

I am, with the greateſt reſpect,

Dear Sir,

Your very humble and

Obedient ſervant,

(Signed) JAMES MAGENNIS.

Dr. Johnſton.

Extract

Extract of a Letter from JOHN SNIPE, *Esq. formerly Surgeon of the Sandwich, now Surgeon to the Naval Hospital at Yarmouth. Dated Yarmouth, June* 17, 1798.

ON the 9th of March, when I joined the Sandwich, a contagious fever raged in that ship, there were daily ten, twelve, or fifteen men sent to the hospital, with fever and ulcerated legs. You are already acquainted with the steps that were taken to subdue this. Our success I attribute to cleanliness, free ventilation, and the diffusing daily the nitrous gas through every part of the ship, and I am convinced, that had that ship been fumigated three or four times a week, with the nitrous vapour, no such fever would ever have been generated, notwithstanding the great number of men that were on board. Suffice it to say, that in three months, this ship was as healthy as any other of her class, although we never had less than 1000 and often 1500 men on board. During the last twelve weeks that she was in commission, I only sent eight men to the hospital. When I first joined her, the smallest scratch rapidly

degenerated into a foul ulcer, but after the febrile contagion was ſubdued, ſores healed as kindly as in any other ſhip.

About three weeks before ſhe was paid off, an Italian cut one of the ſeamen in the thigh with his knife, the wound was about ſix inches long, and nearly two deep, it was ſtitched up, and a double headed roller applied; it healed by the firſt intention, which was a proof that no contagion remained in the ſhip.

From ſome experiments I have made, I am induced to think that febrile contagion, and the general exhalations from the human body, are of an alkaline nature, and that the nitrous vapour equally ſubtile, penetrating into every crevice or corner, wherever it meets the former, deſtroys its peſtiferous qualities, and renders it as inactive as a drop of water. I have repeatedly condenſed the breath and perſpiration of patients in typhus fever, and upon adding an acid to it, an effervescence was viſible: the method I took to obtain a ſufficient quantity of liquid for the experiment, was to make the patients breathe on cold panes of glaſs, and to put the ſame under the bed cloaths, cloſe to the

ſkin.

ſkin, when in a ſtate of perſpiration; in this way half an ounce may be procured in a ſhort time.

Fumigating with the nitrous vapour cannot be too ſtrongly recommended on board of all ſhips, in barracks, hoſpitals, priſons, cloſs cellars, and houſes that are not conſtantly inhabited. Some time ago I had occaſion to go to a ſtore room, that had not been looked into for three weeks or a month, it contained the bedding uſed by the Dutch priſoners before they were ſent to Holland, the whole of which had been fumigated, expoſed to the ſun for two days, afterwards waſhed and perfectly dried before they were put in ſtore; yet the room ſmelled very badly. I immediately ordered it to be fumigated with ſix pipkins, and next morning it ſmelled perfectly ſweeet: for which reaſon I have, and mean to fumigate all the ſtore-rooms, every week.

Laſt winter I tried the nitrous vapour with ſome of the worſt ulcers that perhaps were ever ſeen in any country; the pipkins were placed under the naked ſores. It gave ſome pain, and I could not obſerve any good effects from it, but I beg leave to obſerve that

this was not the fault of the remedy, but the untractable nature of the diſeaſe, for in many caſes, no internal medicine, nor external application, had the leaſt effect, amputation alone ſaved the patient's life. I mentioned this in a letter to Dr. Blane, at the time, but ſince then, I have found it of eſſential ſervice in cleaning foul ulcers, buboes, and ſtumps; and I do not heſitate to give it as my opinion, that if it is properly applied in time, it will be found to be of more ſervice than moſt of the external applications that are at preſent uſed. You are well aware that in many caſes, we have to lament the failure of every exertion.

It is with heartfelt pleaſure I ſay, that I have loſt very few in fevers, ſince I have been at Yarmouth, although we have received a great number in the low typhus fever into the hoſpital; nor is there one inſtance of the contagion being communicated to the ſurrounding patients, which I attribute to the nitrous gas, cleanlineſs and free ventilation.

When the wards were filled with the nitrous vapour, patients who had weak lungs, coughed violently at firſt, but they breathed more freely

freely afterwards, eſpecially if the atmoſphere was thick and heavy, but I never obſerved any bad effects from it, even with patients in the laſt ſtage of conſumption. The nitrous vapour has a moſt aſtoniſhing effect in correcting the fætor in the wards, ariſing from extenſive bad ulcers: this alone is a great comfort both to the patients and attendants. I have ſo high an opinion of the nitrous vapour for deſtroying contagion, and as a corrector of foul air, that I have in the ſtrongeſt manner recommended the uſe of it to ſeveral of my friends, in the different factories in the Mediterranean.

There are many navy ſurgeons prejudiced againſt the nitrous fumigation, beſides it gives ſome trouble, which will at all times operate powerfully with the indolent.

Much praiſe is due to the ingenious author of the nitrous vapour. I have not the honour of his acquaintance, nor did I ever read a word he wrote (for which I bluſh) on the ſubject, but I ſhould be wanting in candour if I did not faithfully relate facts as I found them; and in my opinion, the nitrous vapour tends greatly to deſtroy contagion, and is a moſt powerful corrector of foul air. Query,

Whether or not does it give an additional quantity of oxygen (pabulum vitæ) to the ſurrounding atmoſphere, where it is diffuſed.

I do not expect to have fewer patients in the hoſpital than we have at preſent: there are fifty-three ſhips of war employed in the North Sea, and they never go to Sheerneſs but when in want of repairs. When the fleet comes in, I expect to get fifty or ſixty freſh patients, and they are weekly ſending in ſick by the frigates and cutters. There are only two men in the hoſpital that were wounded in Lord Duncan's action, and the bad ulcers that were received laſt winter are moſtly gone, yet the number is ſtill kept up. There are more caſes of ulcer received into this hoſpital, in proportion, than into the two royal hoſpitals, ulcers as well as pectoral complaints being more frequent in the North Sea, than in the Channel. I have alſo remarked that thoſe who had the moſt obſtinate ulcers had been for ſome years during the war in the Eaſt or Weſt Indies, or in the Mediterranean.

I have an ample field here for obſervation, but little time to put my obſervations

tions on paper, as between the hoſpital, ſick quarters, and priſon, I am kept conſtantly employed.

(Signed) JOHN SNIPE.

Dr. Johnſton.

Extract of a Letter from I. Blatherwick, Eſq. Surgeon. Dated Farham, June 17, 1798.

SIR,

NOT having taken minutes of any obſervations I may have forwarded to you on the ſubject of the nitrous vapour, I am not enabled to ſtate with the preciſion I could wiſh, the particulars relating thereto.—At the time we began to uſe the nitrous vapour as a fumigation, our hoſpitals were free from any contagious diſeaſe, and on the whole, as healthy as I ever knew them. But we never had ſo long a continuance of that healthy ſtate, as while this vapour was uſed in the hoſpital; and it deſerves notice, that ſoon after it was diſcontinued, under the French adminiſtration, the typhus fever again made its appearance with conſiderable ſeverity. No inſtance,

inſtance, to the beſt of my recollection, has occurred of that diſeaſe being communicated either to nurſe or patient, whilſt the nitrous fumigation was employed; whereas many inſtances occurred from time to time, previous to its uſe. The difference on entering a ſurgery ward, after uſing the fumigation, is more remarkable than any other, as it deprives thoſe wards of the ſmell peculiar to them. I have alſo remarked, that fewer patients, with extenſive ulcers, whilſt this was uſed, became hectic, than formerly. In regard to conſumptive patients, I am not at preſent qualified to ſpeak decidedly from any proofs I recollect of its effects, but judging from analogy, I am induced to believe that patients of this deſcription are as likely to receive relief (in ſo far at leaſt as the nature of the complaint admits) as patients in any other diſeaſe; for whatever diſlodges from the air, or corrects the noxious particles accumulated from the effluvia of diſeaſed bodies, muſt mitigate the ſymptoms of this diſeaſe. No arguments I am maſter of can induce the French ſurgeons to adopt it; they complain of its exciting cough, and injuring the catarrhal complaints. They content themſelves with

with burning a few pounds of juniper berries, daily in each hoſpital, notwithſtanding the effect of the diſcontinuance of the former practice, has been evident enough to convince any unprejudiced perſon which deſerves the preference. On the whole, I infer, that the *nitrous vapour* is poſſeſſed of ſtrong antiſeptic qualities—is capable of being adminiſtered in every diſeaſe—can be procured with facility in all places—requires no extra information in the operator; and, in ſhort, is the beſt fumigation I am acquainted with, to be employed where the patients remain in the wards.

(Signed) I. BLATHERWICK,
Superintendant, &c.

James Johnſton, Eſq.

Letter from Captain Lane, of the Navy. Dated Plymouth, June 19, 1798.

SIR,

HAVING been particularly engaged with the Admiral for ſome days paſt, I have not been able to anſwer your letter before, otherwiſe I ſhould not have been ſo tardy in ex-

preſſing the ſatisfaction I feel, in offering my teſtimony of the apparent advantages derived from fumigating with the nitrous acid, in checking at leaſt, if not in ſtopping contagion. Had I ſuppoſed that the ſmalleſt doubt remained on the ſubject, I ſhould have kept a very minute account of every experiment, but as I conceived the thing to have been uncontrovertibly proved before, I ſatisfied myſelf with having recourſe to it, whenever there was any appearance of occaſion for ſo doing, and I can with ſafety ſay, without ever having been diſappointed. On receipt of your letter, I immediately ſent it to Mr. Harris, who has returned it to me, and who I find is exactly in the ſame predicament as myſelf, having been prevented making any particular remarks, by entertaining the ſame opinion of its efficacy as I had, and having been equally ſatisfied with the reſult of his experiments.

With regard to the comparative degree of ſickneſs between the priſons and ſhips, I muſt refer you to the weekly returns. I can however ſay, that when I firſt obtained Dr. Smyth's fumigating materials for the latter, a typhus fever was raging on board the

Prudent, which in Mr. Harris's opinion, was ſo far alarming as to induce me to remove the people from her for a few days, during which time I had her twice fumigated and the decks white-waſhed, after which, the ſame priſoners were returned to her, and ſhe has ſince been as healthy as the other ſhips. When it is conſidered how hot the weather has been, and that I have at times been obliged to put as many as 600 priſoners in the ſixty-fours, I am induced to attribute the preſervation of their health, to the effect of the fumigation, which regularly takes place every Thurſday morning in all the ſhips when the weather permits, having long ſince eſtabliſhed a ſignal to enſure its never being neglected in any of them. With reſpect to the priſon and hoſpital, I am informed by Mr. Harris that whilſt he had the materials for the nitrous fumigation, it was made uſe of when wanted, and always with the deſired effect, but on the French government taking charge of the ſick, the fumigating materials were returned to the Royal hoſpitals along with the other ſtores.

Sorry I am indeed not to have it in my power to be more particular, for nothing can be

be more satisfactorily proved in my mind, than the efficacy of Dr. Smyth's means of checking, if not of destroying contagion, and I cannot but congratulate that gentleman on a discovery which I certainly consider as highly beneficial to mankind, as it must be grateful to his feelings.

(Signed) CHA. HEN. LANE.

James Johnston, Esq.

Extract of a Letter from Alexander Brown, Esq. Surgeon of the Royal Sovereign. Dated Torbay, May 27, 1798.

As a fumigation for a sick room, I consider the *nitrous vapour* as an elegant, ingenious, and useful one. In the morning whilst dressing the sores, two pots are employed for fumigating them, the smoke or vapourous gas evidently sweetens the air, and I do not observe that any particular irritation of the lungs is excited; I have two patients labouring under phthysis pulmonalis, they are commonly placed near to the persons fumigating. I do not find that they cough more than usual,

uſual, unleſs they hold their heads over the fumigating veſſel. I commonly fumigate the ſick berth every night, and the people who ſleep there, ſay the place feels wholeſomer than it does when not fumigated. As for its producing contagion, I have no reaſon to believe it does, at leaſt I have never as yet found correctors or ſweetners of foul air, have that effect.

Some of my brethren here declare that there never was ſuch a heavenly diſcovery for the cure of ulcers of all kinds, as the fumigation with the nitrous gas; and that it poſſeſſes a ſingular healing power (in all habits) which never fails; if ſo, I am ſingularly unfortunate. I have heard of Paterſon's pamphlet ſent to the Captains and Admirals; I am promiſed a reading of it; I ſhall then be able to judge how far I have adminiſtered the vapour with propriety.

(Signed) ALEX. BROWN.

Dr. James Johnſton.

Extract

Extract of a Letter from John Drew, *Esq. Surgeon, dated London, the 17th of June* 1798.

Allow me to lay before you the following obſervation on the ſalutary effects of the nitro-vitriolic fumes, of which I was an eye-witneſs, whilſt Surgeon of his Majeſty's ſhip l'Unité. The ſhip was in general unhealthy, but there were two men in particular ill of putrid fevers, who lay on the lower deck; by conſtantly fumigating under their ham-mocks, I found the diſeaſe ſo much checked in its progreſs as not to extend to any other part of the ſhip's company.

(Signed) JOHN DREW.

Dr. Johnſton.

EXTRACTS

FROM THE

LETTERS OR JOURNALS

OF

SURGEONS OF THE NAVY,

(On the Subject of the Nitrous Fumigation;)

TRANSMITTED TO

DR. CARMICHAEL SMYTH,

BY ORDER OF THE

BOARD FOR SICK AND WOUNDED SAILORS.

Extract from the Weekly Return of Mr. George M'Grath, *Surgeon of his Majesty's Ship Russel, dated Oct.* 26, 1796.

Since we have had the Dutch prisoners on board, I have found particular benefit from fumigating with the nitrous acid in purifying the foul air, and preventing contagious fevers, which otherwise would have originated from the uncleanliness, and filthy indolent dispositions of those men.

Extract from the Journal of Mr. John Drew, *Surgeon of his Majeſty's Ship, l'Unité, between the 22d of November,* 1796, *and the 28th of June,* 1797.

All the intermittent fevers and aguiſh complaints moſtly proceeded from the badneſs of the weather, and the lowneſs of, and dampneſs of the Unité, as the breathing of the people, and the wetneſs of the ſhip produced an infectious kind of air, which never failed to cauſe numbers to be taken ill, notwithſtanding the uſe of ſtoves, and conſtant fumigation compoſed of vitriolic acid and nitre, which I found to be very uſeful, particularly in two caſes of putrid fevers, as by conſtantly fumigating the place where they lay, the infection did not attack any more of the ſhip's company; the exhalations, I think, would anſwer better if the fumigating pots were of another conſtruction, which I refer to your determination.

Extract

Extract from the Journal of Mr. James Runcie, *Surgeon of his Majeſty's Sloop, l'Eſpiegle, between the* 19*th of February*, 1797, *and the* 10*th of February*, 1798.

We had a great many ſcorbutic caſes but they were ſo ſimilar in ſymptoms and treatment that I have not thought it worth while to mention them; there were alſo a variety of febrile and other complaints, of which the above are the moſt conſiderable: the fever introduced by the French priſoners we had a great deal of difficulty in ſubduing, as the infection ſpread very faſt among the people, owing to our being ſo much crowded, and the ſick lying among the ſhip's company, not having room in the brig for a ſick berth; we, however, got at laſt clear of it, by perſevering in ſmoking the veſſel with ſulphur and tobacco every time we went into port: we found the method of fumigating with nitrous acid peculiarly ſerviceable.

Extract from the Journal of Mr. Alexander Aberdour, *Surgeon of his Majesty's Ship Alexander, between the 24th of July,* 1797, *and the 23d of February,* 1798.

I would only here observe, that I have tried the fumigation with the nitrous acid upon coming from Gibraltar, when we had the fever, and apprehend that its progress was arrested by it.

Upon superintending the business, I was seized with a head-ache and slight degree of stupor; every one enveloped in the fumes was affected with coughing.

Extract from the Journal of James Farquhar, *Surgeon of his Majesty's Ship Theseus, between the 25th of February and the 26th of May,* 1797.

I ordered the sick berth to be regularly fumigated every morning and evening at the time we were dressing the ulcers, and found that the nitrous vapour not only purified the air,

air, but in great measure destroyed the very fœtid, and almost intolerable smell occasioned by the discharge from the ulcers; the patients themselves likewise found it very refreshing.

I found myself frequently at a loss for want of a proper vessel to heat the sand in; if one or two small iron pots were ordered to be sent on board with the fumigating materials, they would be found to be very useful.

Extract from the Weekly Return of Mr. Thomas Moffatt, *Surgeon of his Majesty's Ship Triumph, June the 24th,* 1798.

Since last return, the ulcers have been carefully fumigated morning and evening, and I am happy to add, with considerable success. They all look clean, and some have made a little progress in healing already; the fever, which attended several, in a very great degree subsided after three or four days application.

The improvement of the smell in the sick berth is sensibly perceived by all.

Extract from the Journal of Mr. Robert Cinnamond, *Surgeon of his Majeſty's Ship Aſſiſtance, between the 9th of November,* 1797, *and the 5th of June,* 1798.

The only diſeaſes from which infection was to be dreaded were the fluxes, but from a proper attention to cleanlineſs, and a conſtant uſe of the fumigating medicines, I was happy to obſerve there was not one man during theſe laſt ſeven months who ſuffered from contagion, their complaints being evidently produced either from expoſing themſelves to wet and cold, or drunkenneſs. From the ſmall experience I have had of the fumigating medicines, I conſider them of extreme great ſervice.

Extract from the Weekly Return of Mr. James Rolloff, *Surgeon of his Majeſty's Ship Galatea, dated the 5th of Auguſt,* 1798.

I find the fumes of the * vitriolic acid of great ſervice.

* This gentleman meant the nitrous acid.

Extract from the Journal of Mr. Robert Sabine, *Surgeon of his Majesty's Ship Melampus, between the* 20th *of Auguſt,* 1797, *and the* 19th *of Auguſt,* 1798.

The ſhip in general has been very healthy, having had no bad fevers on board, which I attribute to fumigating with the vitriolic acid and nitre, (when the weather was ſo bad as not to allow the beds to be got up) which always took away the diſagreeable ſmell there was between her decks, and by airing between her decks with ſtoves when they were wet.

Extract of a Letter from Dr. Withering, *of Birmingham, to Dr.* Duncan, *of Edinburgh, publiſhed in the third Volume of The Annals of Medicine.*

It is but ſeldom we ſee much typhus at Birmingham. The uſe of the nitrous vapour, in every inſtance of its adoption, ſtopped the further progreſs of infection, ſo that I am perſuaded we are much obliged to Dr. C. Smyth on this occaſion.

Two LETTERS *addreſſed to Dr.* PERCIVAL, *of Manchester, originally publiſhed* (*by Order of the* *BOARD of HEALTH) *in the* Manchester Chronicle, *and republiſhed here, as containing a more full Explanation of the Author's Sentiments on the limited Sphere of Contagion, &c. than is to be met with any where elſe.*

London, July 7, 1796.

MY DEAR SIR,

I am now to acknowledge your obliging favour of the 17th of February laſt, to which I did not give an immediate anſwer, being engaged in the experiment on board the Union, which I undertook at the requeſt of the Lords Commiſſioners of the Admiralty, and the reſult of which I was deſirous to communicate to you, as the beſt and moſt ſatisfactory reply I could give to

* *Manchester, Auguſt* 3, 1796.

"That the thanks of this Board be given to Dr. J. "Carmichael Smyth, for his letters, communicated by "Dr. Percival, and that they be made public."

Signed by order of the BOARD,

THOS. BELLOTT, *Secretary.*

your

your letter. I desired Mr. Johnson to send you a copy of my pamphlet on that subject, as soon as it was printed. Although I have been prevented from writing to you till now, owing to a variety of engagements and business, which it is needless here to explain, I can assure you I have not been forgetful of the benevolent undertaking of your Board of Health, which reflects so much honour on the gentlemen engaged in it, and to which I shall be at all times happy to contribute any assistance in my power to give. The very limited sphere of contagion is so well ascertained, that I have occasion to say little on the subject. In my book on the jail-fever, I have mentioned, after many year's experience as physician to an Hospital, into which more typhus fevers were admitted in proportion than into any other, that the most highly contagious fevers, that occur in our hospitals, do not affect the patients in general, lodged in the same ward; for we had no appropriate fever wards; nor did I ever see the necessity for such, as the communication of infection was in general easily prevented by the means I employed. I have also mentioned, that there is no, or very trifling risk of contagious

gious fevers being propagated in the open air, ſtill leſs from one room or ward to another; and that I never knew contagion propagated by a dead body, even from the diſſection of it, unleſs by inoculation. But, independently of all theſe obſervations, the fumigation with the nitrous acid, if properly employed, not only certainly deſtroys contagion, but improves greatly the atmoſpheric air, by ſupplying a quantity of dephlogiſticated air, or oxygen gas; and it effectually deſtroys all offenſive ſmell. I alſo, as you muſt have obſerved, uſe the diluted marine acid for waſhing the floors, bedſteads, &c. and put marine acid in the pails of water uſed for immerſing the foul linen, &c. In bed-chambers and private apartments I generally keep up, where there is a contagious diſeaſe, a conſtant fumigation; which can eaſily be done by means of a lamp, over which is placed a china cup or ſaucer, with oil of vitriol and nitre, an ounce and a half or two ounces of each being ſufficient for twenty-four hours. If you have any queries to put to me, I need hardly aſſure you, that I ſhall take a pleaſure in anſwering them, and

at

at all times of convincing you of the regard and eſteem of, my dear Sir,

Your ſincere friend,

J. CARMICHAEL SMYTH.

Dr. Percival.

London, Auguſt 1, 1796.

MY DEAR SIR,

I am this moment favoured with your letter of the 30th of July. I can have no objection to your making any uſe, public or private, of my letter to you. The accuracy of the facts I will be anſwerable for; but as it was a private communication to a particular friend, I was little attentive to ſtyle or manner. Reſpecting the limited ſphere of contagion I ſaid the leſs, as I conſidered it a matter ſo well aſcertained, and by ſuch a body of evidence, as required no additional proof. Mankind have been led into error, on this ſubject, by confounding under the general name of contagious or epidemic, diſeaſes of very different natures and origin. But of all thoſe contagions, that are propagated from one diſeaſed perſon, or his clothes, to another perſon, the ſphere of the deleterious power

is

is in general ſo extremely limited, that there have been, and ſtill are, ſome phyſicians, who believe they are only propagated by contact. At Wincheſter, during my ſtay there, one ſoldier only, whilſt doing duty on the priſoners in the airing-ground, was ſeized with the diſtemper; and very few of the military ſuffered, although the guard-room was immediately under one of the priſon-wards, and the ſentinels mixed with the priſoners even in the courts and paſſages of the king's houſe or priſon. And lately, on board the Union, none of the officers ſuffered, and few of the petty-officers; nor would the ſhip's company have ſuffered ſo ſeverely as they did, could their intercourſe with the nurſes and aſſiſtants in the hoſpital have been prevented. But, independently of the limited ſphere of contagion, I will venture to enſure even the nurſes and hoſpital aſſiſtants, in any ſituation, if they will be induced to uſe the proper precautions, and if the hoſpital is properly fumigated; the wards ſprinkled with diluted marine acid; the dirty linen, &c. immediately immerſed in pails, filled with cold water impregnated with marine acid; the chamber-

pots,

pots, ſoil-tubs, &c. quickly removed and waſhed with the ſame; the bedſteads waſhed every time they are empty with the diluted marine acid; and the bed-clothes fumigated with the nitrous vapour. In hoſpitals crowded with ſick, in ſhips, priſons, &c. it is neceſſary to fumigate completely every part of the ſhip, priſon, &c. twice a day. But in common caſes, and in private practice, ſuch means are not neceſſary; and one, two, or three fumigating lamps, in which a conſtant fumigation is kept up, night and day, ſo as to paſs over the beds of the ſick, are perfectly ſufficient. In this manner I have not only ſtopped the common contagion in the hoſpital and in private, but I have equally ſucceeded, which is of great conſequence to be known, in preventing the ſcarlatina anginoſa, or putrid ſore throat, from being communicated to the reſt of the family, living under the ſame roof. Whether this will apply to the ſmall-pox, I cannot ſay from my own experience; but I have been told by Dr. Rollo, Surgeon to the Artillery, and Mr. Cruickſhank, Profeſſor Royal of Chemiſtry to the Academy, that it deſtroys the *miaſma* of the ſmall-pox; and that of two quantities

of

of matter, taken for the purpoſe of inoculation, one was expoſed to the nitrous vapour, the other not: the perſons inoculated with the firſt were not ſeized with the diſeaſe, whilſt the inoculation took the uſual effect, when performed with the ſecond.

I ever remain, with ſincere regard,

Your's truly,

J. CARMICHAEL SMYTH.

Dr. Percival.

CONCLUSION.

WHOEVER reads the preceding pages with attention, muſt be ſtruck with the great conformity of opinion, obſervable amongſt the different individuals, in regard to the principal object of our enquiry, viz. the power of the nitrous vapour to deſtroy contagion.

But although the ſame ſentiment univerſally prevails, I cannot help remarking, that whilſt the opinion of ſome gentlemen is founded on general obſervation alone, the opinion of others is ſupported by ſuch an accurate detail of facts reduced to the certainty of arithmetical calculation, as carry with them a conviction, little ſhort of demonſtration itſelf.

The power of the nitrous vapour on contagion once eſtabliſhed, all its other effects can eaſily be underſtood and explained; one of the moſt obvious of theſe is its deſtroying putrid ſmell. Although I am far from imagining

imagining that putrid ſmell and contagion are one and the ſame, on the contrary, am convinced that they often exiſt independent of each other, yet as they are of the ſame family, and ariſe from a common cauſe, we may fairly ſuppoſe from analogy, that what deſtroys the one, will prove effectual in deſtroying the other. I confeſs, that where there is a direct and poſitive proof, as in the preſent inſtance, reaſoning from analogy is of little conſequence. The obſervation, however, is in itſelf important, particularly for thoſe whoſe duty leads them to an attendance on the ſick, as the offenſive ſmell to which they are expoſed, conſtitutes not the leaſt diſagreeable part of ſuch an office.

But beſides removing the offenſive ſmell of hoſpitals and priſons, another advantage of the nitrous fumigation is that of rendering the air purer and fitter for the purpoſes of animal life; a fact which chemiſtry readily explains. From it we learn, that in the decompoſition of nitre by the vitriolic acid, a certain proportion of vital air *, or oxygen gas,

* "In anſwer to Dr. Smyth's queſtion, What is the "proportion of oxygen and nitric acid, diſengaged by "adding

gas, is let loose; and physiology informs us, that this air, which constitutes a very interesting part of our atmosphere, is necessary for the respiration of animals, at the same time that it is constantly consumed by it.

In a former publication I did not hesitate to give a decided opinion, (judging partly from experience, and partly from the similarity of putrid contagions) that the nitrous vapour would be found equally an antidote to all *, even to the plague itself. I have now the satisfaction to see this opinion confirmed, in so far at least, as relates to the dysentery, a putrid disease equally contagious

" adding half an ounce of oil of vitriol to half an ounce " of nitre?" " I reply that I do not recollect any ex- " periment which has been published to ascertain the " proportion of oxygenous air thus extricated, though " the fact of its extrication is well known, &c."—*Extract of a Letter from Mr. Keir of Birmingham.*

* This fact becomes the more important, it being now clearly ascertained, that the yellow fever, in America at least, is produced by imported contagion. The advantage to a commercial country of being able to counteract all communications of this kind, without subjecting the merchant to the expence and delay of quarantines, is hardly to be calculated.

with the jail fever, and in military hoſpitals, at leaſt, ſtill more fatal.

The efficacy, however, of the nitrous vapour, as appears from almoſt the whole of the reports, is not confined to the deſtroying or preventing the communication of contagion; its ſalutary influence is no leſs remarkable on the ſick and on thoſe recovering from ſickneſs; but on this very important ſubject, I could wiſh the reader to conſult Mr. Paterſon's Table of the Weekly Returns at Forton Hoſpital, from which it appears, that during the ſhort ſpace of ſix weeks, in an hoſpital containing from 300 to 400 men, there was a difference, from employing the nitrous fumigation, of about 50 lives ſaved, and about 110 men reſtored to a ſtate of health fit for active duty; but if the reader is deſirous of forming an accurate judgment of the immediate effect of the nitrous vapour on thoſe ill of typhus fever, I would adviſe him to read with attention, what Mr. M'Grigor and Mr. Hill have written on the ſubject.—By Mr. M'Grigor we are told, that ſome years back, during the prevalence of a fever ſimilar to the one he deſcribes, in the ſame place, the iſland of Jerſey, the

88th

88th regiment to which he belongs, in the ſpace of ten weeks, ſuffered a loſs of 40 or 50 men; whereas during the preſent illneſs, when he employed the nitrous fumigation, of 64 men ſeized with the fever, he did not loſe a ſingle patient. He further remarks, that by uſing conſtantly the nitrous vapour, the malignant ſymptoms of the diſeaſe diſappeared, and that from a typhus it became a ſimple fever.

But of all the advantages to be derived from the uſe of the nitrous vapour, none is more remarkable or likely to be of ſuch extenſive application as its effect on ulcers, an effect firſt taken notice of by Mr. Paterſon, and which has been confirmed, upon every ſubſequent trial.

That the nitrous vapour, by correcting the malignant and contagious air of hoſpitals, which is known to affect * more or leſs, all perſons

* "Having related the moſt diſtinguiſhing marks of "this fever, I ſhall only add, that there are ſometimes "ſlight degrees of it hardly to be characterized; and "which can only be diſcovered in full hoſpitals, by ob- "ſerving the men to languiſh, though the nature of the "illneſs for which they came in ſhould ſeem to admit "of a ſpeedier cure. In ſuch caſes the only ſymptoms

"are

perſons confined in them, ſhould ſo far at leaſt prove ſerviceable to thoſe affected with ulcers, and in general to ſurgical patients; we can readily believe, and indeed it is an induction to which we ſhould have been led, reaſoning as it is called *a priori*. But the nitrous vapour ſeems to be not only uſeful in this way, it is found of efficacy alſo as a topic or local application; its operation, however, as ſuch, muſt have its limits; to ſuppoſe that it will prove a univerſal remedy for all ulcers, is an idea that cannot be entertained for a moment, by any one in the leaſt converſant with the animal œconomy, or with the hiſtory of diſeaſes. Thoſe perſons who are too precipitate in general concluſions, have commonly ſome ground to go back again.

Were I to form a conjecture reſpecting the kind of ulcers in which the nitric acid, either in a gazeous or liquid ſtate, is likely to be found moſt ſerviceable; I ſhould ſay, the ſloughy or ſphacelous, the ſcrophulous, and the ſcorbutic: but thoſe gen-

" are ſlight head-achs, a whitiſh tongue, want of appe-
" tite, and other inconſiderable feveriſh ſymptoms." Vid. Pringle on the Jail or Hoſpital Fever.

tlemen,

tlemen, who are profeſſionally engaged in the treatment of ſuch complaints, will look upon this obſervation more as a hint than an opinion.

The preceding effects of the nitrous vapour are what have been obſerved by all or by many; but there is one which reſts as yet on the authority of Mr. Paterſon alone. He only has made trial of it, and with ſucceſs, in the hooping cough. His remarks on this ſubject, I muſt ſay, are extremely intereſting, and open a wide field for the reflexion and experience of the practical phyſician.

Having finiſhed the few obſervations I had to offer, on the letters and reports which I have now the honour to lay before the public; the reader I hope will pardon me if I detain him a few minutes longer, to make one remark which relates principally to myſelf. It cannot have eſcaped his notice any more than it has done mine, that, as appears by ſeveral of the letters, there are prejudices entertained againſt the nitrous fumigation by many ſurgeons of the navy. At this I am by no means ſurpriſed; we are all children of habit, and unwilling to relinquiſh

opinions

opinions which we entertained in early life: the introduction, however, of the nitrous fumigation into the navy, has been oppoſed not by prejudice only, but by arguments drawn from chemiſtry. It would be no very difficult taſk for me to point out the fallacy of ſuch chemical reaſoning, but to endeavour to refute by argument what is directly contrary to experience and obſervation, would be an abuſe of time, and an inſult to the public judgment. The only anſwer then that I ſhall give to ſuch philoſophers, is to addreſs them in the words of an author, whoſe opinion muſt be conſidered of high authority on ſuch a ſubject, as he was not only a phyſician of character, but certainly one of the firſt chemiſts in Europe; the circumſtances and occaſions were perfectly ſimilar.

" Comme il* n'a certainement eu en vue que
" le bien de l'humanité, il me permettra quel-
" ques reflexions qui ont bien pu échapper
" au ſavant chimiſte, mais que ne pouvoient
" manquer de frapper un médicin, qui quoi-
" que amateur zélé de la chimie & convaincu
" des avantages qu'elles peut procurer à l'art

* The perſon alluded to was Le Sage, who oppoſed chemical reaſoning to experience and obſervation.

" de

" de guérir, a été trop ſouvent témoin des
" erreurs que cette ſcience a portées dans la
" médicine, pour n'etre pas toujours en
" garde contre elle; d'autant plus même, que
" ſes raiſonnemens ſont plus ſeduiſans, & ſes
" expériences en apparence plus conclu-
" antes."

Mémoire par Monſieur Bucquet,

Profeſſeur de Chimie, Cenſeur Royal

De L'Academie Royal des Sciences, &c. &c.

FINIS.